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AUTHOR	Rossmiller, Richard A.; And Others
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ABSTRACT

Cost, resource utilization, and productivity were studied in 41 elementary schools using Individually Guided Education (IGE) and in 15 matched pairs of IGE and non-IGE schools. Instructional expenditures in IGE and non-IGE schools did not differ significantly. However, IGE teachers devoted significantly more time to individual instruction. A production function approach identified the input and process variables most related to achievement in reading and mathematics and student self-concept. Several variables were consistently related to student achievement: (1) teachers' involvement in a degree program; (2) years of teaching experience; (3) teachers' sex; (4) students' maturity; (5) students' social confidence; (6) teachers' perception of the principal's leadership; (7) teachers' job satisfaction; and (8) teachers' involvement in decision making. A set of 12 independent variables accounted for 78% of the variance in reading achievement and a similar set of 12 variables accounted for 71% of the variance in mathematics achievement; all of these variables were susceptible to control by teachers and administrators. Another similar set of 12 variables accounted for 72% of the variance in social confidence scores; these variables reflected the ambience of the school rather than specific instructional processes. (Author/GDC)

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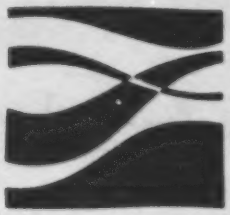

RESOURCE UTILIZATION AND PRODUCTIVITY IN IGE SCHOOLS

by Richard A. Rossmiller, Terry G. Geske, Lloyd E. Frohreich, Michael Doro, and Helen W. Johnson

Wisconsin Research and Development Center for Individualized Schooling Monograph Series

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Richard A. Rossmiller
Faculty Associate

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ABSTRACT

This monograph summarizes the results of studies of cost, resource utilization, and productivity in elementary schools using the system of Individually Guided Education (IGE). We obtained data for the studies from a random sample of 41 IGE schools and 15 matched pairs of IGE and non-IGE schools.

Instructional expenditures in IGE schools did not differ significantly from those in non-IGE schools. However, teachers in IGE schools spent their time differently than did their counterparts in non-IGE schools. IGE teachers devoted significantly more time to 1:1 instruction, particularly in reading and mathematics, and significantly less time to large group instruction.

A production function approach was used to identify the input and process variables that were most closely related to student achievement in reading and mathematics and to student self-concept. Several variables were found to be related consistently to student achievement in reading and mathematics. Among them were (a) teachers' involvement in a degree program, (b) years of teaching experience, (c) teachers' sex, (d) students' maturity, (e) students' social confidence, (f) teachers' perception of the principal's leadership, (g) teachers' expression of job satisfaction, and (h) teachers' involvement in decision making.

A set of 12 independent variables accounted for 78 percent of the variance in reading achievement and a similar set of 12 variables accounted for 71 percent of the variance in mathematics achievement. All of the variables included in the two composite sets were susceptible to control by teachers and administrators. One subscale of the Self-observation Scales, social confidence, served as a proxy for student self-concept. A set of 12 variables similar to those employed in the analyses of reading and mathematics achievement accounted for 72 percent of the variance in social confidence scores. The independent variables most closely related to social confidence tended to reflect the ambience of the school rather than specific aspects of the instructional process.

Chapter 1
INTRODUCTION

The purpose of this monograph is to summarize and synthesize studies which dealt with cost-effectiveness and productivity in the Individually Guided Education (IGE) system of elementary schooling. These initial studies attempted to determine the efficiency and effectiveness of the IGE system, and to identify those resources which most heavily affected student achievement in IGE schools.

In one study, Rossmiller and Geske (1977a) examined school expenditure data for IGE and non-IGE schools. They also looked at how instructional personnel spent their time. The study addressed two basic questions:

1. Do IGE schools cost more or exhibit different expenditure patterns than non-IGE schools?
2. Do instructional personnel in IGE schools allocate their time differently than instructional personnel in non-IGE schools?

In another study, Rossmiller (1978) analyzed an extensive array of data concerning input, process, and output variables gathered from elementary schools which used the system of Individually Guided Education (IGE). Answers were sought to the following questions:

1. Which input and process variables are most closely related to student achievement in reading?
2. Which input and process variables are most closely related to student achievement in mathematics?
3. Which input and process variables are most closely related to student self-concept?

Conceptual Framework

Earlier work by Rossmiller and Geske (1977b) outlined a conceptual framework for economic analysis of education. It helps clarify the sequence in which variables are involved in the process of formal schooling. The conceptual framework shown in Figure 1 consists of four major components: (a) inputs to the educational system, including policies which constrain or control the system's operation, (b) the formal educational system (school) and the processes associated with that system, (c) outputs of the educational system, and (d) feedback. The framework enables one to follow the inputs (resources which the external environment — school community, school district, state, or nation —

supplies the formal education system with) through the educational process occurring within the school or classroom, to the outcomes of schooling. Feedback ties system outputs to both the educational process and the system inputs. Changes can be made to modify either the process or inputs to more efficiently accomplish specified objectives.

Individually Guided Education

Individually Guided Education (IGE) offers a major alternative to the traditional age-graded, self-contained classroom form of schooling at the elementary level (Klausmeier, Rossmiller, & Saily, 1977). The comprehensive IGE system consists of seven major components:

1. a model for organizational-administrative arrangements (the multiunit school),
2. a model of instructional programming,
3. a model for evaluating student learning,
4. curriculum materials and instructional procedures,
5. a program of home-school-community relations,
6. a network of human and material resources, and
7. continuing research and development.

The organizational structure of the multiunit elementary school (MUS-E) encourages open communication among school personnel and promotes instructional programming for the individual student. Designed to provide a hospitable environment for all of the components of IGE, the organizational hierarchy of the multiunit school consists of three interrelated groups: the Instruction and Research (I & R) unit at the student level, the Instructional Improvement Committee (IIC) at the building level, and the Systemwide Program Committee (SPC) at the district level. The MUS-E organizational model uses differentiated staffing, team teaching, multiage grouping, continuous progress, and shared decision making.

The most important component of the IGE system is the Instructional Programming Model (IPM) for the individual student. The IPM assesses each student's beginning level of performance, rate of progress, style of learning, and other behavioral characteristics. The model is used with explicitly specified instructional objectives and criteria to analyze progress toward attaining the objectives.

The third major component, a model for evaluating student learning, aids instructional decision making. This model involves five steps: (a) formulating instructional objectives, (b) setting performance criteria, (c) measuring progress toward objectives, (d) comparing measurement to criteria, and (e) making decisions. The IIC, interacting with the staff of the I & R units, determines objectives for the entire

school, and the I & R unit determines objectives for the unit and individual students within the unit.

The success of IGE depends upon the fourth component, developing and making available curricular materials and instructional procedures that are compatible with the IPM. Curricular materials developed to accommodate a variety of individual differences among pupils should incorporate four main attributes: (a) the materials should be accurate and reliable; (b) the materials should be learnable; (c) the materials and related activities should be teachable; and (d) the materials should be accessible to the staff and usable in an instructional setting.

The success of an IGE school also depends on an effective program of home-school-community relations. The IGE system encourages meaningful parental and citizen involvement in the school organization at all levels. The program of home-school-community relations has three general objectives:

1. To ensure that the staff is aware of available resources and is responsive to the educational expectations of the community, parents, and students.
2. To ensure that the community, parents, and students are aware of and responsive to the requirements for implementing IGE.
3. To ensure that staff and community are involved actively in both the changeoever to IGE and the refinement of IGE.

The sixth component, a supportive network of human and material resources, is necessary to maintain and strengthen each IGE school. The network is both intra- and extraorganizational in nature. The intraorganizational resources are provided by the multiunit structure; extraorganizational resources are provided by state education agencies, intermediate education agencies, teacher education institutions, and other groups such as teachers' associations and parent organizations.

The final component of IGE is a program of continuing research and development which contributes knowledge needed for ongoing refinement of the IGE system.

Cost Studies of IGE

Relatively few studies of the costs associated with Individually Guided Education have been conducted. Evers (1973) conducted a study to identify increases or decreases in expenditures by schools during their first year of implementing IGE/MUS—E. A survey instrument collected data for expenditures in the categories of student costs, staff

costs, staff development, instructional materials and equipment, and physical plant and furnishings. Based on data obtained from a stratified sample of 39 schools in eight states, Evers drew the following conclusions:

1. The majority of the schools reported no increase or decrease in expenditures related to vandalism and pupil absenteeism.
2. The majority of schools reported no change in expenditures related to instructional salaries or use of consultants, increased salaries for paraprofessionals being the only exception.
3. The majority of schools reported no change in expenditures for instructional materials, equipment, or school plant furnishings. In addition, they found that they were able to use materials and equipment more efficiently.
4. The majority of schools reported higher expenditures for in-service materials, workshops, and conferences.

In a similar study, Boardman and Hudson (1973) developed a cost analysis model that could be used to identify the various cost factors directly associated with the implementation and continuation of IGE. They also estimated expenditure changes resulting from adoption of the IGE program. The following cost categories were investigated: (a) staff development, (b) instructional personnel, (c) instructional materials, (d) administration, (e) public relations, (f) physical plant, and (g) league participation.

The findings of this study were quite similar to those reported by Evers. The authors reported an increase in expenditures for staff development, with average expenditures for preservice IGE workshops totalling $4,738 and expenditures for inservice IGE workshops averaging $1,805. Expenditures for inservice materials were high, but costs for visitations, consultants, and professional books were very low. Additional expenses for instructional personnel resulted from more extensive use of aides and additional stipends paid to unit leaders.

The schools sampled reported no additional expenditures for instructional materials and equipment for either classrooms or the resource center as a result of implementing the IGE program. These schools also reported no increase in costs for secretarial and administrative tasks. In addition, reports of "no expenditure" on facilities for IGE programs reflected the opinion of school officials that building changes and new furnishings would have been necessary regardless of the type of instructional program used.

Time and Learning

A number of researchers have examined the impact of several socioeconomic and school variables collectively through the concept of "time" or "foregone" learning. Bloom (1974) discussed some findings on the relationship between time and learning. After reviewing several studies, Bloom pointed out that a student in one school may spend about two years learning what a student in another school learns in one year. "Or, to put it into time and human resources spent, it may cost twice as much for a particular level of learning in one place as it does in another place" (p. 682).

Bloom discussed the notion of elapsed time, i.e., the amount of time spent from the beginning of a learning unit until the completion of the unit at a standard level of mastery. Bloom suggested that student variation in total elapsed time is about five to one. In other words, because of differences in learning rates, the slowest five percent of the learners take about five times longer to reach mastery than the fastest five percent. The amount of elapsed time, however, decreases as the student progresses through a sequential set of learning units, eventually approximating a ratio of three to one.

Bloom also discussed the notion of "time on task," of the amount of time the learner is actually engaged in learning. Intelligence and aptitude tests are good predictors of the percent of elapsed time that students will spend on the task in the beginning of a course. As students proceed through the course, however, the percent of time on task is largely determined by (a) achievement during the preceding units of the course, (b) interest in the subject, and (c) quality of instruction. Bloom reported that the multiple correlations of these three variables with achievement are typically about .85 and with time on task about .75. The author concluded that additional research is needed to gain a better understanding of time and its use in school learning.

Wiley and Harnischfeger (1974) developed a conceptual model based on the notion that the amount of schooling students receive has a significant impact on their achievement. The model delineated three subcomponents which determine quantity of schooling: (a) attendance, (b) length of school day, and (c) length of school year. The model also links individual pupil characteristics, individual pupil attendance, teacher characteristics, and instructional quality to exposure time. Based largely on Carroll's (1963) model of school learning, the authors specified achievement as basically a function of four fundamental time factors: (a) total allocated exposure time, (b) percent usable exposure time, (c) percent active learning time, and (d) total needed learning time. After applying the model to elementary and secondary school statistics from selected states, they concluded that of the four time factors

influencing achievement, the variable "total allocated exposure time" would be most amenable to important policy modifications. They further pointed out the wide variation that exists in the amounts of exposure allocated to pupils within classes, between classes, between schools, and between districts, and contended that instructional time can be reallocated by altering policies that are directly under the control of states and districts.

No previous studies on allocating and using time in IGE schools have been reported. In view of the nature of the IGE approach, however, the use of time in IGE schools should vary considerably from that found in more traditionally organized schools.

Productivity in Education

Production function analysis stems from the discipline of economics and has been applied extensively in the field of business. It assumes that productivity can be maximized by measuring and comparing the results obtained from various combinations of resource inputs as a basis for resource allocation decisions. An equation that describes the transformation of a set of resource inputs into the desired outputs is known as a *production function* (Cohn, 1972, pp. 237-240). Theoretically at least, application of production function analysis should permit one to identify the particular combination of inputs that will maximize the desired output (or outputs) of the educational process. The following equation represents a prototype production function for education:

$$A_{it} = g(F_{i(t)}, S_{i(t)}, P_{i(t)}, I_{i(t)}),$$

where A_{it} are the educational outcomes for the ith student at time t,

$F_{i(t)}$ are the student's family background characteristics cumulative to time t,

$S_{i(t)}$ are school inputs relevant to the ith student cumulative to time t,

$P_{i(t)}$ are peer or fellow student characteristics cumulative to time t, and

$I_{i(t)}$ are the initial or innate endowments of the ith student at time t (Levin, 1974).

The equation indicates that the educational outcomes exhibited by a student (i) at any given point in time (t) are a function (g) of the student's family background, formal schooling, associations with peers, and innate endowments. Note that school inputs are only one of the four factors; the other three factors — family background, peers, and the innate ability of the student — are not within the control of the school.

A number of studies using production function analysis have been reported during the past 10 years. A portion of the Coleman report (the section which dealt with pupil achievement and motivation) employed an input-output framework to measure the effect of various inputs on pupil achievement (Colemen, 1966, pp. 217-333). Coleman found that school resources contributed relatively little to the variance in achievement compared to environmental and socioeconomic variables.

However, many researchers were unwilling to accept the proposition that school resources had little or no affect on academic achievement. Critics of Coleman's work suggested that the relationship between school resources and academic achievement had been substantially understated because of defects in the measurement of school resources, inadequate control for social background, and/or the use of inappropriate statistical techniques.

A number of researchers reanalyzed the Equality of Educational Opportunity (EEO) data and, although hampered by limitations of the original data, they clarified some of the problems involved in applying the production function concept to the learning process. In one of the first reanalyses, Hanushek (1968) estimated educational production functions for black and white sixth graders in northern metropolitan schools. Hanushek's results indicated that certain teacher characteristics, such as verbal ability and years of experience, were significantly related to student achievement.

Bowles (1970) reanalyzed a subset of the EEO data consisting of 12th grade black male students. His work reaffirmed the importance of teacher characteristics and suggested that certain other school inputs, for example, the average amount of time a teacher spent in guidance activities and the number of days school was in session during the school year, were also important. Bowles argued that student characteristics such as attitude and motivation can be viewed as either inputs to or outputs of the learning process, and developed a model utilizing a set of simultaneous equations to determine the relative effects of such variables.

Levin (1970) also took advantage of the EEO data base, using a sample consisting of 600 white sixth grade students drawn from 36 schools in a large northeastern city. Levin obtained statistically significant relationships between student achievement, teacher experience, and quality of undergraduate institutions attended by teachers. Levin pointed out that some factors affecting student achievement are, at the same time, affected by achievement. To investigate this interactive process, Levin illustrated the interdependence of student achievement, student motivation, student efficacy, and parental attitudes, and presented a methodology for solving the complex system of simultaneous equations that differed from the technique employed by Bowles.

Kiesling (1967, 1969, 1970) used production function analysis techniques in several studies. He found (1967) that per pupil expenditures related positively to student performance. This relationship was strongest in urban school districts and weakest in rural school districts. Kiesling observed that students gained 2.6 months in achievement scores with an additional expenditure of $100, but only gained 1.4 months at the high end of the expenditure range. He also found that school district size and student performance were not related.

In another study, Kiesling (1969) found that the occupation index related significantly to student achievement for all subgroups in both urban and nonurban categories. In the urban districts, per pupil expenditures related negatively to achievement, while per pupil expenditures had no effect in the nonurban districts.

In a third study, Kiesling (1970) reported that the amount of school resources devoted to central administration and supervision was most consistently related to pupil achievement. In addition, the level of teacher certification, especially at the fifth grade level, and the number of students per classroom also related positively to student achievement.

Several researchers published input-output studies in individual states or school districts in 1968. Katzman (1968) used cross-sectional data from 56 elementary schools in Boston to examine the importance of home background factors and school variables in explaining change in student achievement between second and sixth grade. Using a stepwise multiple regression technique, he obtained statistically significant relationships between gains in reading scores and the percentage of students in noncrowded classrooms, the number of students in the attendance area, and the percentage of teachers with 1 to 10 years of teaching experience. In addition to providing further evidence that teachers do affect pupil performance, Katzman also pioneered the use of several noncognitive measures of school output such as school holding power and student aspirations.

Cohn (1968) investigated input-output relationships in 337 public high school districts in Iowa utilizing data from the Iowa State Department of Public Instruction. He controlled statistically for geographic and population differences with a set of eight school district variables serving as measures of input. He used the gain in student achievement scores between 10th and 12th grades as the output measure. Employing multiple regression techniques, Cohn found that higher teacher salaries and fewer different teaching assignments were associated with larger growth increments in test scores. Cohn also estimated the optimal school size in Iowa to be about 1,500 students in average daily attendance.

Summers and Wolf (1975) studied the academic progress of approximately 2,000 students in 150 schools of the Philadelphia School

System. Using longitudinal data, they examined the achievement growth of individual pupils between the end of 3rd and the 6th grades, the 6th and the 8th grades, and the 9th and the 12th grades. They tied socioeconomic factors and specific school resources to data on individual pupils. Summers and Wolf found that the performance of specific types of students was better in some situations. Black students, for example, appeared to do better in the smaller elementary schools.

The authors concluded that school inputs, such as teachers and class size, and school climate variables, such as racial composition, achievement mixture, and disruptive incidences, did influence student achievement. All types of students at all grade levels scored higher in achievement the more days they attended school. Likewise, all types of elementary students learned more in schools where 40 to 60 percent of the student body was black and in schools with a larger percentage of high achievers.

Elementary school students also did better in smaller classes and with teachers who graduated from higher rated colleges. Low achieving elementary students did better with relatively less experienced teachers, in smaller classes, and in schools with more high achievers.

Murnane (1975) investigated the impact of school resources, especially teachers, on the cognitive achievement of inner-city children in New Haven, Connecticut. The sample consisted of 875 black children in 15 elementary schools. He gathered data over a two-year period (second and third grades) for one group of children and over a one-year period (third grade) for another group. After examining the effect of the classroom as a whole on the achievement of children, Murnane concluded that important variations in the amount of learning occur in different classrooms within the same school and among different schools. He found that background factors and previous experience had a greater influence upon student reading achievement than upon math achievement. Differences in the quality of classroom environments were found to exert a greater effect on student math achievement than on reading achievement. Murnane also discovered that black teachers with less than six years of experience taught reading to black children more effectively than did white teachers with similar teaching experience. In addition, a high student turnover rate in a class had an adverse affect on children's reading achievement, particularly on the progress of high achievers.

Although the production function approach holds promise as a tool for identifying ways of varying resource inputs to increase the efficiency of schools, one must also recognize the shortcomings of this approach. Garms, Guthrie, and Pierce (1978, pp. 253-257) identified four major problems associated with the production function approach: (a)

the validity of applying a technical-industrial model to the educational process; (b) the disagreement over goals of schooling; (c) the limitations of available measurement technology; and (d) the inability to control for "outside" influences.

With regard to the first problem, some persons believe that because schooling is at such a low level of technological development, application of an industrial model for assessing productivity is inappropriate. There is at least the possibility that every school has its own unique production function. Unlike many manufacturing operations, public schools can exercise little, if any, quality control with regard to one of their most important inputs, namely, the pupils who attend the school.

Production function analyses assume that a clearly defined set of outputs has been agreed upon. In education, however, there is a great deal of disagreement over the goals of schooling, particularly with regard to specific outcomes and priorities. Although consensus may exist about the broad goals of schooling, these broad goals usually are not susceptible to measurement and when specific measurable goals and objectives are sought, the consensus rapidly breaks down.

Assuming that agreement on goals and priorities could be reached, the problem of measuring these goals remains. Educators depend heavily on standardized norm-referenced tests to measure outcomes, yet such tests indicate only whether an individual pupil scored higher or lower than other students. Production function analyses can be no more reliable than the instruments used in measuring the variables.

As was noted earlier, only one of the four factors in the generalized production function equation consisted of school inputs. Family background, innate ability, and peer group relationships are almost entirely beyond the control of the school. Yet there is ample evidence that family, peer group, and innate intellectual capacity relate to a child's school achievement. Despite these limitations, however, the production function approach aids in understanding relationships among the many variables that enter into schooling.

Chapter 2
DESIGN AND METHODOLOGY

During the summer of 1975 the staff of the Wisconsin Research and Development Center's Organizational and Administrative Arrangements Work Group conducted a major study involving a national sample of IGE schools. At the same time, the Center's Evaluation component obtained data needed for a comparative study involving a small sample of both IGE and non-IGE schools. By using the same sample population, the researcher staff obtained enough data for several studies.

The Organizational and Administrative Arrangements project required data concerning student achievement, student self-concept, organizational structure, leader behavior, expenditures for instruction, and the use of time by teachers and administrators; the research conducted by the Evaluation component entailed measuring the degree to which the seven basic components of IGE had been implemented in the school as well as defining and measuring the direct and indirect outcomes of IGE schooling. This section delineates the design and methodology employed for the studies of resource allocation, time utilization and input-output relationships.

Sample

The research staff used a sample consisting of 41 IGE schools and 15 non-IGE schools representing 13 states. They used the Research and Development Center's 1973-74 IGE Multiunit Elementary School Directory to identify a population of 959 schools which had used the IGE system for at least two years. Approximately 20 percent of these schools were located in urban areas and a stratified random sampling procedure ensured a representative sample. The IGE schools were stratified into "city" and "other" classifications; the former category included those schools located in urban areas with a population of at least 200,000 and the latter category included those with a population under 200,000 according to 1970 census data. After drawing a random sample of schools from each of these groups, the researchers conducted a telephone survey to solicit information from the schools and request their cooperation in the study.

The telephone interview schedule determined whether or not a school met the following minimal criteria established for participation in the study:

1. The entire school had to conform to the multiunit organizational pattern;
2. The school had to use multiaged grouping in each of the I & R units;
3. Instructors had to have used the instructional programming for reading for at least two years and for mathematics for at least one year;
4. The school had to have I & R units which met at least once a week, and a functioning Instructional Improvement Committee;
5. The unit leaders could not be new to the selected unit, nor could more than one-half of the teachers be new to the selected unit.

A sample consisting of 41 IGE schools was obtained by calling in order the randomized schools in each group. Approximately 100 schools classified as "other" were called to obtain 33 schools that (a) met the established criteria and (b) were willing to participate in the study. Likewise, approximately 50 schools were called to obtain eight urban schools. Within each of these 41 schools, one intermediate I & R unit in which the data concerning students and teachers would be gathered was chosen randomly.

For the study of resource allocation and time utilization, the researchers used data from all 41 IGE schools. For comparative purposes they selected a smaller sample consisting of 15 non-IGE schools to match 15 of the IGE schools. The matched sample of non-IGE schools could not be selected until they chose the sample of IGE schools. The following basic criteria were established to identify non-IGE schools which would match, as closely as possible, the IGE schools:

1. The school should be located in the same or an adjacent school district;
2. The school should have a traditional self-contained, age-graded classroom organization;
3. The school should be similar in terms of size, socioeconomic characteristics, and staff experience;
4. The school should contain grade levels that paralleled the intermediate unit level in IGE schools.

Selection of non-IGE schools was completed in December 1975 in order to meet the scheduled data collection that began in January 1976. The basic procedure followed was to call the superintendent of the school district in which a participating IGE school was located and ask him, or a designate, to identify a non-IGE school within the district that met the foregoing criteria. The final sample consisted of 15 matched pairs of IGE and non-IGE schools. The research staff decided upon a

sample size of 15 because of time constraints, problems in identifying suitable non-IGE schools, and difficulties in obtaining district approval to conduct the comparative research. Within each of the 15 non-IGE schools, classes of the appropriate age and grade level were randomly selected to approximate the size of the IGE school's intermediate unit. Selected characteristics of the 41 IGE schools and the 15 pairs of matched IGE and non-IGE schools are presented in Appendix A.

The sample used in the input-output study was a subsample consisting of 28 of the original 41 IGE schools that provided data complete enough to warrant including them in the multiple regression analyses of input-output relationships.

Instrumentation and Data Collection

Two instruments were designed specifically for the resource allocation portions of the studies — the School Expenditure Data form and the Time Allocation of Instructional Personnel form. These instruments provided information about how teachers and administrators spend their money and time in IGE schools.

School Expenditures

The School Expenditure Data form obtained data concerning expenditures made by a specific school. The instrument included only those categories considered to be most directly related to instruction and most likely to be available from the individual schools within a school district. The instrument included four major expenditure categories: (a) instruction, (b) plant operation, (c) plant and equipment repairs, and (d) capital outlay. The instruction category was further subdivided into salaries, supplies and materials, textbooks, library and audiovisual materials, and other expenses; plant operation included salaries, supplies and materials, utilities, and other expenses; plant and equipment repairs consisted of a single item; and capital outlay included replacement of instructional equipment and additions to instructional equipment. Each of these expenditure categories was specifically defined. The school principal or a designate, e.g., superintendent or business manager of the district completed the school expenditure form. The expenditure data requested were for the 1974-75 school year, the most recent school year for which complete data were available.

Time Utilization

The second instrument, Time Allocation of Instructional Personnel, requested designated personnel in the schools sampled to estimate the total amount of time, both in school and out-of-school, that they devoted to their professional responsibilities. The respondents were asked to divide their total time between "direct instruction of pupils" and

"activities other than direct instruction of pupils." They further separated the total amount of their direct instructional time by curricular areas, e.g., reading, language arts, mathematics, science, social studies, and other, and by mode of instruction, e.g., independent study or one-to-one, small group (3-5 students), class-size group (25-35 students), and large group (75-150 students). Similarly they were asked to partition their noninstructional time into eight, defined subcategories: (a) supervision of pupils; (b) planning; (c) testing/assessing/evaluating; (d) record keeping; (e) inservice training; (f) clerical/secretarial; (g) administrative; and (h) other. The respondents reported the amount of time they spent per week in each of these various activities in either hours or percentage of total time. The instructions indicated that "best estimates" were sufficient and that "stop watch" accuracy was neither expected nor required.

The time allocation instrument gave directions for completing the form to the principal, unit leader, unit teacher, aide, intern, or unit secretary in IGE schools, and to the principal, teacher, aide, or intern in non-IGE schools. In Category II, direct instruction of pupils, under mode of instruction, the subcategory entitled "large group" (75-150 students) used for IGE schools was changed to "more than one class" for the non-IGE schools. Except for the minor differences noted above, the instruments used in the IGE and non-IGE schools were identical.

For the Resource Allocation-Time Utilization study, a total of 35 of the 41 IGE schools (85 percent) and 14 out of the 15 non-IGE schools (93 percent) provided reasonably adequate data on school expenditures. At the same time, 245 participants in 39 of the 41 IGE schools and 94 participants in all 15 non-IGE schools returned completed time allocation forms. Of the 245 forms returned from the IGE schools, 171 (70 percent) were usable and of the 94 forms returned from the non-IGE schools, 85 (90 percent) were usable. The 171 usable time allocation forms from the IGE schools were obtained from 28 principals, 29 unit leaders, 94 teachers, and 20 aides. The 85 usable forms from the non-IGE schools were obtained from 12 principals, 66 teachers, and 7 aides.

A number of the time allocation instruments were not used because the respondents did not properly complete the forms. A few of the respondents who reported extraordinarily high or low amounts of time, e.g., 10 hours or 85 hours per week, apparently either failed to report all of the time they devoted to their professional responsibilities or overestimated the time they devoted to some of the various activities. It was decided to exclude from the analyses reported times that totaled less than 20 hours or more than 60 hours a week. Likewise, some of the respondents who reported percentages of time failed to report the total number of hours against which the percentages could be applied.

For the Input-Output study, 28 of the 41 schools provided complete expenditure data. The time allocation data used in the Input-Output study were obtained from 28 principals, 28 unit leaders, 82 IGE teachers, and 12 aides. The 28 schools were selected based on the accuracy and adequacy of the data as determined by examining the descriptive statistics and raw data for each variable.

Other Instruments

Several other instruments used in studies of the organizational arrangements in IGE schools also provided information about resource allocation, time utilization, and input-output relationships. They are briefly described as follows:

Personal background. This instrument helped obtain data on the education, experience, and related professional activities of the participating staff members in each school. Principals, unit leaders, and unit teachers completed the instrument.

Decision-involvement. The purpose of this instrument was to obtain data on the decision-making processes in the school. Unit leaders and unit teachers completed this form, which assessed their level of involvement in the decision process and their satisfaction with that level of involvement.

Principal leadership. An adaptation of the Survey of Organization instrument was used to obtain teachers' insights concerning the leadership of their principal. The instrument measured four aspects of leadership: support, goal emphasis, work facilitation, and interaction facilitation.

Job satisfaction. This form determined the extent of job satisfaction expressed by personnel in IGE schools. This instrument was based on the Index of Organization Reactions scales, with specific items developed for use in IGE schools. The principal, unit leader, and unit teachers completed the instrument.

Pupil outcomes. The Self Observation Scales (SOS), Intermediate Level, Form C, measured the students' self-concept. The Comprehensive Test of Basic Skills, Expanded Edition, Level 2, assessed student achievement in reading and mathematics. Pupils in the intermediate I & R unit selected in each school completed these instruments. The self-concept survey was administered to one-third of the students in the unit, the mathematics test to one-third of the pupils, and the reading test to one-third of the pupils. Thus, no student took more than one test.

After selecting a school for possible participation in the study, a letter was sent to the principal which explained the nature of the research. After a school had agreed to participate in the study, the research team randomly selected the intermediate unit in which pupils would be tested and mailed a letter to the school which explained testing procedures. The various research instruments were included in a packet that was mailed to the school approximately one month prior to the scheduled on-site visit. Participants were asked to complete the instruments before the researchers visited the school during January or February 1976. During the on-site visits, the researchers met with the principal and members of the instructional staff to answer questions, collected the completed instruments, and administered tests to the pupils in the appropriate I & R unit.

Chapter 3

RESOURCE ALLOCATION AND TIME UTILIZATION IN IGE AND NON-IGE SCHOOLS

The use of money and time, two of the major school resources, is of primary concern to educational researchers seeking ways to make the educational production process more efficient. On an applied level, school administrators often question the efficiency of alternative educational programs. Very often, these new programs and innovative techniques are met with scepticism because they are viewed as a drain on the human and material resources of a school system at a time when these resources are becoming increasingly scarce. There is the additional risk that a new program or process will do no more to enhance learning than did the method it replaced, or even worse, will be less effective. The purpose of this chapter is to compare an innovative approach to schooling (IGE) with a more traditional approach to find out if differences exist in expenditures or in the use of school resources.

As discussed previously, IGE offers an alternative to the traditional age-graded, self-contained classroom form of schooling at the elementary level. Because of the major differences between organizational structures and instructional philosophies in IGE and more traditional systems of schooling, we asked the following questions:

1. Do IGE schools cost more or exhibit different expenditure patterns than non-IGE schools?
2. Do instructional personnel in IGE schools allocate their time differently than instructional personnel in non-IGE schools?

Data Analysis

Since the primary focus of the study was to provide general information concerning expenditures and time allocations, we calculated descriptive statistics for the entire sample of 41 IGE schools. We computed the means, standard deviations, and number of schools reporting for the various school expenditure and time allocation categories for the IGE schools sampled. In addition, we calculated t-tests for the 15 matched pairs of IGE and non-IGE schools to determine if the differences between means in any of the categories were significant. Findings for the school

expenditure and time allocation categories are presented in the following sections.

Expenditures

Based upon the conceptual framework described in Chapter 1, school resource inputs fit into two general categories — human and material resources. Human resources include students, teachers, administrators, and other staff personnel; material resources include the school plant, desks, classroom equipment, curricular materials and other supplies that are used for learning. Money is used to purchase various human and material resources which are necessary to the schooling process.

Both human and material resource costs were examined in the study. The research team divided school expenditures into four broad categories: instruction, plant operation, repairs to plant, and capital outlay. These categories broke down further into subcategories and the mean expenditure for each category for the IGE schools sampled is reported in Table 3.1.

Clearly, the most costly school resource input is personnel. Salaries for instructional personnel constituted the largest expenditure item within the category of instruction. Mean per pupil salaries were calculated for principals, teachers, and other certified personnel, clerks and secretaries, and others. For the 35 schools reporting, the average per pupil expenditure for total instructional salaries was $655.76, and this amount accounted for over 80 percent of the total expenditures for instruction. Teacher salaries, as expected, accounted for the vast majority of salary expenditures, averaging $511.34 per pupil, or 78 percent of the total dollars spent for salaries. Salaries for the remaining instructional personnel categories accounted for a much smaller portion of salary expenditures. For example, expenditures for other certificated personnel averaged $62.20 per pupil, those for principals were $45.37 per pupil, and those for secretarial/clerical staff averaged $22.30 per pupil. Additional instructional expenditure categories consisted of instructional supplies, textbooks, and travel-related expenses. Average per pupil expenditures for these categories were $16.22, $13.75, and $3.37, respectively. Average expenditure per pupil for plant operation amounted to $89.20. Repairs to plant averaged $8.78 per pupil, and capital outlay expenditures amounted to $6.07 per pupil.

To answer the first research question, "Do IGE schools cost more than non-IGE schools?", the mean expenditures for the four broad categories and for selected subcategories were compared for each of the matched pairs of IGE and non-IGE schools. Table 3.2 shows the means, t-test values, and number of schools reporting for each expenditure category. The t-test values indicate whether or not a statistically

Table 3.1

Costs per Pupil for Selected Expenditure Categories in the Sample of IGE Schools

Expenditure categories	Mean	Standard deviation	Number of schools reporting
Instruction			
1. Principal(s) salary	45.37	19.88	35
2. Teachers' salary	511.34	228.42	35
3. Other certified personnel	62.20	67.85	28
4. Secretarial/clerical	22.30	14.39	35
5. Other salaries	32.57	27.87	29
6. Total salaries	655.76	282.52	35
7. Instructional supplies	14.07	13.58	34
8. Other supplies	3.19	3.23	28
9. Total supplies	16.22	15.10	35
10. Textbooks	7.19	4.88	30
11. Library books	4.08	3.78	35
12. Periodicals/newspapers	.56	.88	30
13. Audio-visual	2.79	2.75	31
14. Other	1.07	1.38	18
15. Total books	13.75	9.95	35
16. Travel	1.44	1.88	30
17. Expenses for inservice	1.28	1.61	21
18. Other expenses	2.38	4.37	16
19. Total other expenses	3.37	5.00	32
Plant operation			
20. Plant engineer(s) salary	13.18	13.53	18
21. Custodian(s) salary	42.00	22.94	34
22. Supplies and materials	5.22	6.07	27
23. Utilities	37.78	51.67	31
24. Other expenses	5.46	9.72	15
25. Total plant operation expenses	89.20	78.56	34
Repairs to plant			
26. Repairs to plant	8.78	10.39	27
Capital outlay			
27. Replace instructional equipment	3.39	4.00	25
28. Add instructional equipment	3.85	4.85	30
29. Total capital outlay	6.07	8.15	32

significant difference existed between two means, i.e., the probability that the observed difference could have occurred purely by chance.

In general, the differences between the mean expenditures for the IGE and non-IGE schools were not statistically significant at the .05 level for any of the expenditure categories.[1]

Looking at the instructional salaries category for the matched pairs, the total mean salary for IGE personnel totalled $599.32 per pupil compared with $546.35 per pupil for non-IGE schools, a difference of approximately $50.00 per pupil. Within the subcategories of instructional salary expenditures, teachers' salaries again made up the largest expenditure category with IGE teachers averaging $453.61 per pupil and

[1]Although none of the differences were significant at the .05 level, some of them were statistically significant at the .10 level.

Table 3.2

T-test Values for Selected Expenditure Categories in Matched IGE and Non-IGE Schools

Expenditure categories	Means IGE	Means Non-IGE	T-test values	Probability	Matched pairs reporting
Instruction					
1. Principal(s) salary	39.32	35.28	1.25	.24	11
2. Teachers' salary	453.61	415.64	1.14	.28	11
3. Other certified personnel	49.13	71.04	-1.01	.34	8
4. Secretarial/clerical	20.18	17.12	1.48	.17	11
5. Other salaries	45.50	25.64	1.32	.23	7
6. Total salaries	599.32	546.36	.91	.39	8
7. Instructional supplies	11.56	8.71	2.09	.06	11
8. Other supplies	3.12	1.01	2.20	.07	7
9. Total supplies	13.59	9.80	1.70	.13	8
10. Textbooks	5.34	7.96	-2.21	.06	9
11. Library books	3.15	2.92	.29	.78	11
12. Periodicals/newspapers	.35	.35	.05	.96	8
13. Audio-visual	1.79	1.91	-.22	.83	9
14. Other	.37	.76	-.54	.62	4
15. Total books	9.36	12.76	-1.84	.11	8
16. Travel	.92	.47	1.45	.18	10
17. Expenses for inservice	.81	.35	1.48	.21	5
18. Other expenses	.79	.18	1.14	.48	2
19. Total other expenses	.00	.00	—	—	0
Plant operation					
20. Plant engineer(s) salary	19.29	17.10	.42	.70	4
21. Custodian(s) salary	38.24	31.68	1.37	.20	11
22. Supplies and materials	3.50	5.09	-1.37	.21	8
23. Utilities	22.56	22.00	.17	.87	10
24. Other expenses	5.15	4.18	.29	.79	4
25. Total plant operation expenses	74.25	65.88	.77	.46	8
Repairs to plant					
26. Repairs to plant	5.25	6.72	-.61	.56	8
Capital outlay					
27. Replace instructional equipment	1.70	2.54	-.93	.39	7
28. Add instructional equipment	2.89	2.34	.69	.51	9
29. Total capital outlay	2.93	6.36	-2.73	.07	4

non-IGE teachers averaging $415.64 per pupil. In most of the remaining subcategories for instructional salaries, salaries for IGE personnel were slightly higher than those for non-IGE personnel. The one exception was in the category of other certified personnel where mean expenditures for non-IGE staff amounted to $71.04 per pupil compared with $49.13 per pupil for IGE staff.

While, on balance, expenditures for instructional supplies were higher for IGE schools ($13.59 compared with $9.80 for non-IGE schools), they were offset by greater expenditures in non-IGE schools for textbooks, other books, and audio-visual equipment. Total expenses for plant operation were greater for the IGE schools, while plant repairs and capital outlay expenditures were greater for the non-IGE schools.

Allocation of Time

Of central importance to the educational process is the use of time. In this study, we collected data for teachers, unit leaders, and principals, and divided the total amount of time into instructional and noninstructional activities.

Instructional activities included those activities directly related to the student-teacher interaction process. The total amount of instructional time was separated by curricular areas including reading, language arts, mathematics, science, social studies, and other subjects, and by mode of instruction including one-to-one, small group, class size group, large group, and other grouping patterns. Table 3.3 compares how IGE teachers and unit leaders distributed their time among the various curricular areas and modes of instruction.

Unit leaders, or lead teachers, are a personnel category unique to the IGE system. While unit leaders teach within the unit, they also plan with the principal and other teachers and coordinate the activities of the teachers in their instructional unit. Based on the IGE schools sampled, unit leaders and teachers allocated similar amounts of time to instructional activities. Unit leaders reported spending an average of 23.85 hours per week on instructional activities and unit teachers reported spending an average of 23.73 hours per week on instructional activities. Unit leaders tended to devote more time to class size instructional groupings while unit teachers tended to devote more time to one-to-one and small group instruction. With regard to the curricular areas, unit leaders reported more involvement in language arts, math, and social studies while unit teachers reported more involvement in reading and science.

Unit leaders allocated slightly more hours to noninstructional activities than did unit teachers. Noninstructional activities refer to those tasks which are not directly related to instruction but which aid the instructional process. The various categories of noninstructional activities included: supervision, planning, testing, record keeping, inservice, clerical, administrative, and other activities. Of the average 20.33 hours per week devoted to noninstructional tasks, unit leaders indicated that the majority of their time was spent on planning (6.61 hours) and clerical activities (4.03). Similarly, of the average 18.30 hours per week that unit teachers devoted to noninstructional duties, planning took 6.16 hours per week and clerical activities, 3.51 hours per week. With the exception of inservice work, where unit teachers spent .76 hours per week compared with .67 hours per week for unit leaders, the latter group averaged somewhat more time in the remaining noninstructional categories.

Table 3.3

Comparison of Time Allocation for Unit Leaders[a] and Teachers in IGE Schools

		Means[a]		Standard deviation	
		Unit leaders	Teachers	Unit leaders	Teachers
Total instruction hours		23.85	23.73	7.30	5.94
Reading	1:1	1.54	1.72	1.72	1.78
	Small group	1.98	2.31	2.34	2.33
	Class size	2.37	1.91	2.56	2.46
	Large group	.03	.02	.19	.13
	Other	.00	.01	.00	.13
Language arts	1:1	.90	1.08	1.07	1.38
	Small group	.53	.60	.90	1.06
	Class size	2.74	2.33	1.92	2.00
	Large group	.10	.03	.41	.16
	Other	.00	.00	.00	.00
Math	1:1	2.07	2.14	1.82	1.93
	Small group	1.74	1.25	1.88	1.60
	Class size	1.95	1.61	1.95	1.90
	Large group	.34	.005	.19	.05
	Other	.00	.00	.00	.00
Science	1:1	.38	.64	.92	1.35
	Small group	.30	.45	.63	.91
	Class size	1.41	1.84	1.41	3.46
	Large group	.10	.02	.31	.13
	Other	.00	.00	.00	.00
Social studies	1:1	.57	.66	1.04	1.35
	Small group	.24	.41	.41	.90
	Class size	2.32	1.88	2.08	1.76
	Large group	.07	.06	.26	.25
	Other	.00	.00	.00	.00
Other	1:1	.47	.61	.95	1.17
	Small group	.32	.39	.75	.89
	Class size	1.78	1.73	3.47	2.98
	Large group	.24	.05	.88	.28
	Other	.00	.00	.00	.00
Total mode of instruction	1:1	5.92	6.85	4.54	5.52
	Small group	5.12	5.41	3.86	4.37
	Class size	12.57	11.29	7.80	7.79
	Large group	.59	.18	1.06	.50
	Other	.00	.13	.00	.13
Total curricular areas	Reading	5.93	5.97	2.21	3.06
	Language arts	4.28	4.04	2.09	2.20
	Math	5.79	5.00	3.18	2.15
	Science	2.20	2.94	1.81	3.71
	Social studies	3.20	3.01	2.07	2.38
	Other	2.80	2.76	3.72	3.38
Total noninstruction hours		20.33	18.30	7.75	8.00
Supervision		1.19	1.20	1.27	1.42
Planning		6.61	6.16	5.21	4.70
Testing		3.26	3.05	2.99	3.10
Record keeping		3.07	2.70	2.23	2.42
Inservice		.67	.76	.75	1.16
Clerical		4.03	3.51	3.38	3.52
Administrative		.64	.31	1.20	.64
Other		.82	.63	1.53	1.18

[a] IGE unit leaders, $N = 29$; IGE teachers, $N = 94$.

The second research question was: "Do instructional personnel in IGE schools allocate their time differently than instructional personnel in non-IGE schools?" To answer this question, the study compared time allocation patterns for teachers and principals in both IGE and non-IGE settings (see Table 3.4).

Table 3.4

T-test Values for Time Allocation Categories for Teachers in Matched IGE and Non-IGE Schools (N = 13)

		Means		T-test	
		IGE	Non-IGE	values	Probability
Total instruction hours		25.20	23.20	1.32	.21
Reading	1:1	1.66	.73	2.24	.04
	Small group	2.02	1.22	1.35	.20
	Class size	2.03	2.47	−.61	.55
	Large group	.04	.40	−1.71	.11
	Other	.00	.25	−1.49	.16
Language arts	1:1	1.12	.53	1.21	.25
	Small group	.60	.56	.12	.90
	Class size	2.42	2.93	−.97	.35
	Large group	.04	.02	−.47	.65
	Other	.00	.04	−1.00	.34
Math	1:1	1.70	.67	2.53	.03
	Small group	1.06	.84	.47	.65
	Class size	1.46	2.34	−1.66	.12
	Large group	.00	.55	−2.26	.04
	Other	.00	.05	−1.00	.34
Science	1:1	.94	.13	1.27	.23
	Small group	.50	.54	−.23	.83
	Class size	2.00	2.17	−.81	.44
	Large group	.01	.02	−1.00	.34
	Other	.00	.00	—	—
Social studies	1:1	.81	.29	1.35	.20
	Small group	.49	.56	−.49	.63
	Class size	2.43	2.70	−.63	.54
	Large group	.05	.25	−.83	.42
	Other	.00	.00	—	—
Other	1:1	.80	.20	2.29	.04
	Small group	.57	.43	.64	.53
	Class size	2.53	2.25	.41	.69
	Large group	.13	.04	1.47	.17
	Other	.00	.08	−1.43	.18
Total mode of instruction	1:1	6.84	2.55	3.22	.007
	Small group	5.24	4.15	.78	.45
	Class size	12.85	14.85	−.96	.35
	Large group	.26	1.27	−2.59	.02
	Other	.00	.42	−1.70	.11
Total curricular area	Reading	5.75	5.07	.74	.48
	Language arts	4.18	4.08	.14	.89
	Math	4.22	4.47	−.36	.73
	Science	3.43	2.85	.84	.42
	Social studies	3.58	3.79	−.56	.59
	Other	4.03	3.00	1.50	.16
Total noninstruction hours		19.84	17.28	1.12	.29
Supervision		1.41	2.14	−1.60	.14
Planning		8.35	5.86	1.71	.11
Testing		2.67	2.26	.90	.39
Record keeping		2.33	1.81	1.54	.15
Inservice		.83	.51	1.74	.11
Clerical		3.16	4.13	−1.11	.29
Administrative		.24	.10	1.59	.14
Other		.94	.20	2.42	.03

For teachers, total average instructional hours were not significantly different, with IGE and non-IGE teachers reporting totals of 25.20 and 23.20 hours per week, respectively. The two groups did, however, show distinctive patterns in dividing their time among the various subject areas and instructional modes. Both IGE and non-IGE teachers spent a majority of their time in class size instructional groupings averaging 12.85 and 14.85 hours per week, respectively. However, IGE teachers allocated twice as much time each week (12.08 hours) to one-to-one and small group instruction as compared with non-IGE teachers (6.70). Concerning the curricular areas, IGE teachers devoted more time to reading (5.75 hours), language arts (4.18 hours), science (3.43 hours), and other (4.03). Non-IGE teachers spent more hours in the areas of math (4.47) and social studies (3.79) during a typical week.

Total noninstructional hours were also comparable for both IGE and non-IGE teachers. IGE teachers averaged 19.84 hours per week while non-IGE teachers logged an average of 17.28 hours per week on noninstructional activities. Planning was the leading noninstructional category for both groups. IGE teachers reported spending 8.35 hours per week on planning compared with 5.86 hours reported by non-IGE teachers. Clerical activities were the second largest time-consuming activity for the two groups of teachers. Non-IGE teachers spent approximately one hour per week more than did IGE teachers doing clerical tasks. The two groups spent comparable amounts of time in testing, record keeping, and inservice work but non-IGE teachers engaged in more supervision than did IGE teachers.

The final comparison presented in this summary is between IGE and non-IGE principals. Due to the nature of their role, principals generally spend more time on facilitative or noninstructional activities than on direct instruction (see Table 3.5). As illustrated in Table 3.5, the total amount of time spent on instruction by the two groups of principals is very small, with IGE principals reporting 1.05 hours during a typical week and non-IGE principals reporting .40 hours.

IGE and non-IGE principals both devoted the major portion of their time to noninstructional concerns. Non-IGE principals reported an average of 46.70 total hours per week spent on noninstructional activities. This was four hours more than the amount of time reported by IGE principals (42.60 hours). As expected, principals allocated the greater portion of their time to administrative activities reporting 19.60 and 24.57 hours per week in IGE and non-IGE settings, respectively. While the two groups of principals spent comparable time on supervision (four hours) and testing (one hour), non-IGE principals exceeded their IGE counterparts in the time spent on planning, record

keeping, and clerical activities. Two notable exceptions are the categories of inservice and other activities where IGE principals reported spending nearly double the amount of time reported by non-IGE principals. In no case, however, were the differences statistically significant.

Table 3.5

T-test Values for Time Allocation Categories for Principals in Matched IGE and Non-IGE Schools (N = 10)

		Means		T-test	
		IGE	Non-IGE	Values	Probability
Total instruction hours		1.05	.40	.60	.56
Reading	1:1	.00	.00	—	—
	Small group	.50	.20	.54	.60
	Class size	.00	.00	—	—
	Large group	.00	.00	—	—
	Other	.00	.00	—	—
Language arts	1:1	.00	.00	—	—
	Small group	.00	.00	—	—
	Class size	.00	.00	—	—
	Large group	.05	.00	1.00	.34
	Other	.00	.00	—	—
Math	1:1	.00	.00	—	—
	Small group	.00	.00	—	—
	Class size	.00	.00	—	—
	Large group	.00	.00	—	—
	Other	.00	.00	—	—
Science	1:1	.00	.00	—	—
	Small group	.00	.00	—	—
	Class size	.00	.00	—	—
	Large group	.00	.00	—	—
	Other	.00	.00	—	—
Social studies	1:1	.00	.00	—	—
	Small group	.00	.00	—	—
	Class size	.00	.00	—	—
	Large group	.00	.00	—	—
	Other	.00	.00	—	—
Other	1:1	.00	.00	—	—
	Small group	.00	.00	—	—
	Class size	.00	.00	—	—
	Large group	.50	1.00	.11	.97
	Other	.00	.00	—	—
Total mode of instruction	1:1	.00	.00	—	—
	Small group	.50	.20	.54	.60
	Class size	.50	1.00	.43	.68
	Large group	.05	.00	1.00	.34
	Other	.00	.00	—	—
Total curricular areas	Reading	.50	.20	.54	.60
	Language arts	.05	.00	1.00	.34
	Math	.00	.00	—	—
	Science	.00	.00	—	—
	Social studies	.00	.00	—	—
	Other	.00	.00	—	—
Total noninstruction hours		42.60	46.70	−2.04	.07
Supervision		4.20	4.07	.13	.90
Planning		2.60	5.40	−.86	.41
Testing		1.10	1.65	−.75	.47
Record keeping		.20	1.35	−2.10	.07
Inservice		4.35	2.25	1.46	.18
Clerical		.20	1.07	−1.12	.29
Administrative		19.60	24.57	−1.00	.34
Other		9.83	6.32	.80	.44

Findings and Implications

The findings concerning resource allocation and time utilization in IGE and non-IGE schools may be summarized as follows:

Question 1: Do IGE schools cost more or exhibit different expenditure patterns than non-IGE schools?

1. IGE schools do not cost more than non-IGE schools.
   a. Differences in mean expenditures per pupil of IGE and non-IGE schools were not statistically significant at the .05 level for any of the expenditure categories.
   b. Salaries of instructional personnel accounted for over 80 percent of total expeditures reported.
   c. Principals' salaries and teachers' salaries were somewhat higher per pupil in IGE schools.
   d. Salaries of other certified personnel were somewhat higher per pupil in non-IGE schools.
   e. Differences between the means approached statistical significance for the following four expenditure categories:
      1 - instructional supplies,
      2 - other supplies,
      3 - textbooks, and
      4 - total capital outlay.
2. Expenditure patterns in IGE schools varied somewhat from those found in non-IGE schools.
   a. IGE schools spent more per pupil for instructional and other supplies than did non-IGE schools.
   b. IGE schools spent less per pupil for textbooks and other books than did non-IGE schools.

Question 2: Do instructional personnel in IGE schools allocate their time differently than instructional personnel in non-IGE schools?

1. Teachers in IGE schools do spend their time differently than their counterparts in non-IGE schools.
   a. Teachers in IGE schools devoted more time to their jobs (45 hours/week) than teachers in non-IGE schools (40.5 hours/week).
   b. IGE teachers allocated:
      1 - two more hours per week to direct instruction of pupils.
      2 - two and one-half hours more per week to noninstructional activities.
2. Differences between the means of the two groups for both total instructional and total noninstructional hours were not statistically significant.
3. Differences in the allocation of time to several of the sub-

categories were statistically significant at the .05 level:

a. Reading on a 1:1 basis (greater in IGE schools).
b. Math on a 1:1 basis (greater in IGE schools).
c. Math on a large group basis (greater for non-IGE schools).
d. Other curricular areas on a 1:1 basis (greater for IGE schools.
e. Total instruction on a 1:1 basis (greater for IGE schools).
f. Total instruction on a large group basis (greater for non-IGE schools).
g. Teachers in IGE schools spent significantly more time in 1:1 instruction and significantly less time in large group instruction than did teachers in non-IGE schools.

4. Neither principals in IGE schools nor those in non-IGE schools spent much time in direct instruction of pupils.
5. Principals in IGE schools spent somewhat less time on noninstructional activities (42.6 hours/week) than did principals in non-IGE schools (46.7 hours/week).

The finding that expenditures per pupil were comparable in both IGE and non-IGE schools has important practical implications for schools. Districts considering the implementation of IGE are now provided with a stronger rationale for doing so. Instead of making additional demands on scarce material and human resources, the IGE system rearranges existing resources so that students are actually exposed to a greater amount of instruction. These observations imply that a potentially more efficient use of school resources occurs in IGE schools.

Chapter 4

INPUTS AND OUTPUTS IN IGE SCHOOLS

Educators think that the types of human and material resources used in the schooling process and how these resources are combined will affect the outcomes of schooling. Several input-output studies of schooling have been reported during the past dozen years, including Coleman's well-known study of *Equality of Educational Opportunity* (Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld, & York, 1966). Recently, production function analysis has contributed to the study of the educational production process.

Production function analysis, a method used extensively in economics and business, assumes that productivity can be maximized by measuring and comparing mathematically the results obtained from various combinations of resource inputs. An equation that describes the transformation of a set of resource inputs into the desired outputs is known as production function. Application of production function analysis enables one to identify (at least theoretically) the particular combination of inputs that will maximize the desired output(s) of the process under study.

In this study, using production function analysis, the research team examined the effects of input and process variables on reading and mathematics achievement, and on social confidence of students in a sample of IGE schools. Data for the 134 variables included in the analyses were available for 28 of the 41 schools included in the original sample. Using the conceptual framework formulated by Rossmiller and Geske (1977), the 134 variables were categorized as either input, resource mix, or output variables which were further grouped into subcategories. The input category included staff background, expenditure, and student self-concept variables; the resource mix category included time allocation and organizational variables; and the output category included student achievement and student self-concept variables. Appendix B lists definitions and descriptive statistics for each of the 134 variables.

Inspection of the descriptive statistics for each variable revealed that some data elements were either incomplete or inaccurate. For example, problems of this type were encountered with some of the discrete expenditure elements within broader expenditure categories. Where these problems could not be resolved, the variable was dropped from the data set.

The unit of analysis for the study was an Instruction and Research (I & R) unit within each IGE school included in the study, not individual teachers or pupils. Although some individual teachers and pupils within the unit supplied data, it was necessary to use mean scores for the I & R unit on each variable. For example, the value used for age of teachers was the mean age of the teachers in the I & R unit.

The analyses proceeded in the following manner. First, descriptive statistics for the variables were examined for completeness and adequacy. Second, variables judged to be complete and adequate were examined by computing a matrix of product moment correlations between each variable. Third, a subset of variables from each subcategory was selected for use in stepwise multiple regression analyses based on the strength of their correlation with output measures, and their relative independence from other variables in the original subcategory.

The stepwise regression analysis consisted of four steps. First, selected input and resource mix variables were employed as independent variables in regression equations to ascertain their relationship to the output (dependent) variable. Second, a backward selection procedure was employed in which all variables were entered and then removed sequentially with those contributing least being the first removed. Third, a final regression equation was developed containing those independent variables which had correlation coefficients significant at the .10 level. Fourth, the independent variables in each subcategory which were found to explain the greatest amount of variance in the output (dependent) variable under study were identified and combined in a second stepwise regression analysis. This analysis isolated a composite set of independent variables which most adequately explained the variance of the output variable.

Reading and mathematics achievement and social confidence were the variables used as output (dependent) measures for the production functions calculated in this study. Of the seven self-observation scales, social confidence was the most useful predictor of both reading and mathematics achievement. Social confidence was chosen as a proxy measure of student self-concept because of its high and positive correlation with all other subscales of the self-observation scales except school affiliation.[1]

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[1]The self-concept of a student may be viewed as an input to the educational production process because it may affect a student's receptivity to the process and content of schooling. Student self-concept also may be viewed as a product or output of schooling. That is, one's experiences in school may alter one's self-concept. Consequently, it was decided to investigate the relationship of various input variables to one measure of student self-concept, namely, social confidence.

The Production Function for Reading Achievement

Examination of the 20 variables which measured background characteristics of teachers in the I & R unit, and study of the product moment correlations between each variable and reading achievement eliminated 9 of the 20 variables.[2] Of the remaining background variables, only BIQ2 (presently enrolled in a degree program) and BIQ15 (age) were retained in the final equation. Enrollment in a degree program exhibited a partial correlation of —.462 with reading achievement and was statistically significant at the .015 level. Age was statistically significant at the .007 level with a partial correlation of .506 with reading achievement. These two variables accounted for about 34 percent of the variance in reading achievement compared with 41 percent of the variance accounted for when all 11 background variables were included in the analysis.

A total of 52 measures of time allocation by subject area, instructional mode, and noninstructional activity were available. Examination of the descriptive statistics and of the product moment correlations for these 52 variables resulted in selection of 12 variables for inclusion in the regression analysis. The final equation retained six variables: Time spent in 1:1 instruction in reading (R1TO1), time spent in small group instruction (RSMALL), time spent in a class size instruction in reading (RCLASS), time spent in supervision (IIIA), total time spent in reading instruction (TREAD), and total time spent in language instruction (TLANG). The coefficient of multiple correlation for these six variables with reading achievement was .613. The six variables accounted for about 38 percent of the variance in reading achievement, compared with 44 percent when all 12 variables were included in the analysis.

Although data were gathered for 38 variables measuring various aspects of expenditures for instructional purposes, inspection of the data revealed that for many of the variables either no expenditures were reported or those reported were obviously estimates. Consequently, the researchers decided to use the major standard school accounting categories, i.e., expenditures for instructional salaries, supplies, and books; other expenses of instruction; school plant operation; and capital outlay. The only variable retained in the final equation, instructional salaries (SALARY), was significant at the .08 level. Expenditures for instructional salaries accounted for about 11 percent of the variance in reading achievement, compared with the 17 percent accounted for when all six expenditure variables were included in the regression equation.

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[2]The 11 background variables also were used in the production function analyses for mathematics achievement and student social confidence.

Obviously, none of the expenditure variables were very useful predictors of reading achievement.

All seven measures of student self-concept were used in the initial analysis. Examination of the product moment correlation of each variable with total reading achievement revealed that only security was not significantly correlated with reading achievement. However, the only self-concept variable retained in the final equation was social maturity. It was statistically significant beyond the .001 level and accounted for approximately 64 percent of the variance in reading achievement, compared with 66 percent when all seven variables were included in the equation. Thus, social maturity alone was almost as useful as the entire set of seven variables in terms of predicting the reading achievement score for this sample.

All of the organizational variables except (IPMMATH) (teachers' perception of the extent of IPM implementation in mathematics) were included in the analysis. Examination of the product moment correlations of the organizational variables revealed that none of them were significantly correlated with reading achievement. The final regression equation yielded a coefficient of multiple correlation of .574 and accounted for approximately 33 percent of the variance in reading achievement. Three variables were retained in the final equation. Decision involvement of teachers (DIATOTQ3) exhibited a partial correlation of .403 with reading achievement; teachers' total job satisfaction (TOTJSAT) had a partial correlation of .466; and teachers' perception of the principal's leader behavior (PRLDRSHP) exhibited a partial correlation of —.512.

Table 4.1 summarizes the results of the final equation for each subcategory and each composite set of variables. It shows the variables retained in the final equation for each category, the partial correlation coefficients for the variables that were retained, the coefficient of multiple correlation, and the amount of variance in reading achievement accounted for by each final question.

From the preceding analyses it was possible to identify some variables in each of the five categories which were quite closely associated with reading achievement. The variables from each category which appeared to be most closely associated with reading achievement were included in two composite sets of variables and again regressed against reading achievement. In examining the results, one must be aware that multiple regression equations are affected by the number and nature of the specific variables that are included in each equation. Therefore, as one changes the set of variables included in a regression equation, the solution will change. The two sets that were chosen for this analysis represent only two of many sets that could have

Table 4.1

Summary of Final Regression Equations for Categories and Composite Sets of Variables on Reading Achievement

Variable category	No.	Variable Name[a]	Partial correlation coefficient	Partial *F* value	Significance level	*R*	R^2
Staff background	2	BIQ2	−.482	6.793	.015	.5804	.2369
	15	BIQ15	.506	8.607	.007		
Time allocation	22	R1:1	−.497	6.891	.016	.8129	.3756
	23	RSMALL	−.514	7.559	.012		
	24	RCLASS	−.506	7.234	.014		
	53	IIIA	−.361	3.152	.090		
	61	TREAD	.504	7.156	.014		
	62	TLANG	.413	4.312	.050		
Expenditures	108	SALARY	.332	3.221	.084	.3320	.1102
Student self-concept	114	MATURITY	.800	46.148	.000	.7998	.6396
Organization	126	PRLDRSHP	−.512	8.542	.008	.5743	.3298
	127	TOTJSAT	.466	6.647	.016		
	129	DIATOTQ3	.403	4.657	.041		
Composite Set No. 1	25	RLARGE	.358	3.620	.069	.7489	.5608
	115	CONFIDNT	.728	27.941	.000		
Composite Set No. 2	7	BIQ7	.572	10.671	.004	.7573	.5734
	24	RCLASS	−.602	12.512	.002		
	108	SALARY	.633	14.724	.001		
	126	PRLDRSHP	−.559	10.012	.004		
	127	TOTJSAT	.593	11.947	.002		

[a]For a complete description of each variable see Appendix B.

been included and therefore the solutions obtained are only two of many potential solutions.

The first composite set included the variables BIQ2, BIQ5, BIQ6, BIQ7, R1:1, RSMALL, RCLASS, RLARGE, TLANG, SALARY, CONFIDNT, PRLDRSHP, and DIATOTQ3. RLARGE (time spent in large group instruction in reading) and CONFIDNT (social confidence) were retained in the final equation with partial correlation coefficients statistically significant at the .07 and .001 levels, respectively. The coefficient of multiple correlation was .7489 and the equation accounted for about 56 percent of the variance in reading achievement, compared with 69 percent accounted for when all 13 variables were included.

Because student self-concept may be viewed conceptually as either an input to the schooling process or as an output of schooling, and because reading achievement and the subscales of the Self-observation Scales are likely to be interrelated (and thus covariates), a second set of variables which excluded student self-concept measures was

chosen. BIQ6, RLARGE, and CONFIDNT were removed and SCHSIZ (school size) and TOTJSAT (teachers' total job satisfaction) were added to form the second composite set.

Five variables were retained in the final equation for Set 2: years of teaching experience (BIQ7), time spent in class size reading instruction (RCLASS), instructional salaries per pupil (SALARY), teachers' perception of principal's leadership (PRLDRSHP), and teachers' total job satisfaction (TOTJSAT). These five variables produced a coefficient of multiple correlation of .7573, accounting for 57 percent of the variance in reading achievement. The partial correlation coefficients of time spent in reading instruction in class size groups (RCLASS) and teachers' perception of the principal's leadership related negatively to reading achievement while the partial correlations of the other three variables related positively to reading achievement.

It should be noted that this analysis, using input and process variables subject (in varying degree) to the control of teachers and administrators, accounted for nearly 72 percent of the variance in I & R unit reading achievement scores. Years of teaching experience, for example, could be considered when filling staff vacancies. The time allocated to various modes of instruction (small group, class size, etc.) can be controlled by teachers. Total expenditures for instructional salaries can also be controlled, at least within limits, although this variable may serve as a proxy for the socioeconomic environment of the school or school district. The behavior of principals may be modified, at least to some extent, and actions can be taken which will increase the job satisfaction of teachers. Generalizations based on the results obtained from this limited sample are not warranted. However, the results of the analysis provide some hope that the reading achievement of students can be improved by giving conscious attention to variables that are within the control of teachers and administrators.

The Production Function for Mathematics Achievement

The same five groups of variables used in the analysis of reading achievement — staff background, time allocation, expenditures, student self-concept, and organization — were used as independent variables in regression equations where the dependent variable was mathematics achievement. Table 4.2 shows the results of the final equation in each set of regression analyses.

The 11 background variables included in the multiple regression analysis for reading achievement were also regressed against mathematics achievement. The final equation retained three

Table 4.2

Summary of Final Regression Equations for Categories and Composite Sets of Variables on Mathematics Achievement

Variable category	No.	Variable Name[a]	Partial correlation coefficient	Partial F value	Significance level	R	R^2
Staff background	2	BIQ2	−.468	6.725	.016	.6806	.4632
	5	BIQ5	.423	5.222	.031		
	7	BIQ7	.471	6.828	.015		
Time allocation	No variables were retained; analysis was terminated.						
Expenditures	No variables were retained; analysis was terminated.						
Student self-concept	115	CONFIDNT	.750	33.376	.000	.7497	.5621
Organization	129	DIATOTQ3	.363	3.802	.062	.4845	.2347
	131	IPMMATH	−.471	7.124	.013		
Composite Set No. 1	7	BIQ7	.427	4.915	.037	.8550	.7310
	35	MLARGE	.532	8.702	.007		
	61	TREAD	−.362	3.320	.082		
	115	CONFIDNT	.797	38.360	.000		
	126	PRLDRSHP	−.366	3.410	.078		
Composite Set No. 2	2	BIQ2	−.518	8.442	.008	.7480	.5595
	5	BIQ5	.495	7.482	.012		
	7	BIQ7	.430	5.205	.032		
	105	SCHSIZ	−.423	5.026	.035		

[a]For a complete description of each variable see Appendix B.

variables: BIQ2 (presently enrolled in a degree program), BIQ5 (sex), and BIQ7 (years of teaching experience). The partial correlation coefficients for sex (higher percentage of males) and years of experience were positively related to mathematics achievement, while that for enrollment in a degree program was negatively correlated. It should be noted, however, that in this case the negative correlation favors enrollment in a degree program because of the way in which responses to the question were scored.

After examining the descriptive statistics and correlation matrix for the 52 time allocation variables, 12 variables were selected for inclusion in the regression analysis. Application of the backward stepwise regression procedure resulted in removal of all variables and the analysis was terminated.

The six expenditure variables included in the regression analysis for reading achievement were also regressed against mathematics achievement. Application of the backward stepwise regression procedure again resulted in all variables being removed from the equation and the analysis being terminated.

Although seven student self-concept measures were included in the regression analysis, only social confidence was retained in the final equation with a coefficient of multiple correlation of .7497. Social confidence alone accounted for approximately 56 percent of the variance in mathematics achievement compared to 59 percent when all seven self-concept measures were included.

Eight organizational variables were included in the regression analysis. Only IPMMATH (teachers' perception of the extent of IPM implementation in mathematics) and DIATOTQ3 (teachers' total decision involvement) were retained in the final equation. These two variables had a coefficient of multiple correlation of .4845 and accounted for about 23 percent of the variance in mathematics compared with the 36 percent explained by the entire set of eight organizational variables.

Again, two composite sets of variables consisting of those which either remained in the final regression equation or which were among the last to be stepped out, were regressed against mathematics achievement. The variables in Set 1 included BIQ2, BIQ5, BIQ6, BIQ7, M1TO1, MSMALL, MCLASS, MLARGE, TREAD, SALARY, CONFIDNT, PRLDRSHP, and DIATOTQ3. The final equation retained five variables: social confidence (CONFIDNT), time spent in large group instruction in mathematics (MLARGE), years of teaching experience (BIQ7), total time devoted to reading instruction (TREAD), and teachers' perception of the principal's leadership (PRLDRSHP). These five variables, which yielded a coefficient of multiple correlation of .8550, were nearly as useful as the entire set of 13 variables in accounting for the variance in mathematics achievement. They accounted for 73 percent of the variance while the entire set of 13 variables accounted for 76 percent.

Again noting that student self-concept may be considered as either an input to the educational process or as an output of schooling, and because mathematics achievement and student self-concept may themselves be covariates, a second set of variables which eliminated all measures of student self-concept was selected. Two other variables were also removed — extent of participation in IGE staff development workshops (BIQ6) and time allocated to large group instruction in mathematics (MLARGE) — and two new variables, school size (SCHSIZ) and teachers' total job satisfaction (TOTJSAT), were added.

The four variables which were retained in the final equation produced a coefficient of multiple correlation of .7480. These four variables accounted for 56 percent of the variance in mathematics achievement, compared to the 71 percent of variance explained by the entire set of 12 variables. The variables retained in this equation consisted of three staff background variables — present enrollment in a

degree program (BIQ2), sex (BIQ5), and years of teaching experience (BIQ7) — and school size (SCHSIZ). Years of teaching experience (BIQ7) was the only variable retained in the final equation which was common to both Set 1 and 2.

Most of the variables retained in the final equation for both Set 1 and 2 are amenable to control or modification by teachers or administrators. Staff background characteristics can be considered when recruiting personnel to fill vacant positions, time allocated for various subject areas and modes of instruction can be varied by teachers, school size can be varied (at least over time), and the principal's leader behavior can be modified (or the principal can be replaced). The results of these analyses suggest that achievement in mathematics can be influenced by variables which are within the control of school personnel.[3]

The Production Function for Social Confidence

As noted previously, self-concept may be viewed as an input to the schooling process because it may affect a student's receptivity to the process and content of schooling, or it may be viewed as a product or output of schooling. That is, if one's experiences in school alter one's self-concept, then self-concept may be regarded, at least in part, as a result of the schooling process. Consequently, the research team decided to investigate the relationship of various input variables to one measure of student self-concept, i.e., social confidence.

Social confidence was selected as a proxy measure of student affective behavior and was used as the dependent variable in the production function analysis of student affective outcomes. Social confidence, one of the seven subscales which together comprise the Self-observation Scales, ranked second only to the social maturity subscale in its relationship to reading achievement and was the subscale most closely associated with mathematics achievement.

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[3]Again, a note of caution in interpreting the results of these analyses should be sounded. Variables retained in the final equation for Set 1 were not retained in Set 2 and vice-versa. These results clearly indicate that multiple regression analyses are sensitive to the particular variables included in the set under analysis, particularly with a small sample such as was employed in this study. The results of a multiple regression analysis depend on the particular set of variables included in the regression equation and the specific sample from which the variables are drawn. A slight change in the sample, in the set of variables included in the regression equation, or in the dependent variable which serves as the criterion, may substantially alter the results. Nevertheless, the results obtained in the foregoing analyses are encouraging for those who believe that schools can and do make a difference in student achievement.

The same procedure followed in analyzing student achievement in reading and mathematics was employed in examining social confidence. Variables from each of four categories — staff background, time allocation, instructional expenditures, and organization — were employed in separate stepwise regression analyses. A composite set of variables from among the four categories was then employed in a final regression analysis. Table 4.3 summarizes the final regression equations for the variables by category and for the composite set.

Table 4.3

Summary of Final Regression Equations for Categories and Composite Sets of Variables on Social Confidence

Variable category	No.	Variable Name[a]	Partial correlation coefficient	Partial *F* value	Significance level	*R*	R^2
Staff background	2	BIQ2	−.586	10.819	.003		
	6	BIQ6	.415	4.786	.039		
	7	BIQ7	.403	4.460	.046		
	20	BIQ20	.401	4.396	.047	.6680	.4462
Time allocation	53	IIIA	−.351	3.685	.067	.3515	.1235
Expenditures	106	SALARY	.405	5.088	.033	.4045	.1637
Organization	No variables were retained; analysis was terminated.						
Composite set	2	BIQ2	−.475	5.819	.026		
	7	BIQ7	.436	4.695	.042		
	32	M1:1	.427	4.451	.048		
	53	IIIA	−.478	5.917	.024		
	105	SCHSIZ	−.380	2.977	.100		
	126	PRLDRSHP	−.472	5.728	.027	.8036	.6458

[a]For a complete description of each variable see Appendix B.

Four of the 11 staff background variables selected for inclusion in the analysis remained in the final equation. The four variables — enrollment in a degree program (BIQ2), participation in an IGE staff development workshop within the past two years (BIQ6), years of teaching experience (BIQ7), and overall feeling about the school (BIQ20) — yielded a coefficient of multiple correlation of .6680. These four variables accounted for nearly 45 percent of the variance in I & R unit scores for social confidence, compared to the 60 percent accounted for by all 11 variables.

Of the ten time allocation variables (IIIA, IIIB, IIIC, IIID, TREAD, TLANG, TMATH, TSOC, T1TO1, and TSMALL) used in the analysis, only IIIA (noninstructional time spent in supervision of

pupils) remained in the final equation. IIIA produced a correlation of .3515 and accounted for about 12 percent of the variance in I & R unit social confidence scores. The way in which teachers allocated their time to instructional and noninstructional activities apparently had little relationship to the social confidence scores of pupils.

The same instructional expenditure variables were regressed against social confidence. Again, only instructional salary (SALARY) was retained. It had a correlation coefficient of .4045 and accounted for about 16 percent of the variance in social confidence scores compared with the 29 percent accounted for by all six expenditure variables. Instructional expenditures exhibited little relationship with social confidence scores.

A composite set of 12 variables was selected from among the four categories of variables analyzed previously. Four measured various aspects of staff background (BIQ2, BIQ6, BIQ7, BIQ20), four were measures of time allocation (M1TO1, MSMALL, IIIA, TBLTOT), two were organizational measures (PRLDRSHP, TOTJSAT), one measured expenditure (SALARY), and one measured school size (SCHSIZ).

Seven variables remained in the final equation and produced a multiple coefficient of correlation of .8036. These seven variables accounted for about 64 percent of the variance in I & R unit social confidence scores compared to the 72 percent accounted for when all 12 variables were included in the equation.

Social confidence was quite closely associated with a set of school input and process variables. Furthermore, the independent variables most closely related to social confidence tended to reflect the ambience of the school rather than specific aspects of the instructional process. Variables such as years of teaching experience, teachers' current enrollment in a degree program, school size, teachers' perception of the principal's leadership, and teachers' total job satisfaction convey a picture of the school as an entity rather than revealing specific elements of the instructional process which strongly influenced the social confidence scores of students. In short, social confidence appears to be related to the general atmosphere of the school rather than to the instructional process variables which were measured.

Findings and Implications

It should be emphasized at the outset of this discussion that broad generalizations based upon this study's findings are not warranted. The limited sample size, the shortcomings of the data base, and the exploratory nature of the research all underline the dangers inherent in developing prescriptions for change in educational policy based on the

findings of this study. The findings do, however, suggest some promising avenues of investigation for those interested in the connections between the inputs, processes, and outputs of schooling. The conceptual view of the educational production process under school conditions described in Chapter 1 provides a useful framework for discussing the findings.

Inputs from the External Environment

The data base employed in this study did not include variables describing the economic, social, or demographic characteristics of the individual schools or their communities. Although census data for the entire school district could have been used, district-wide data were not considered appropriate for use in a study where all other elements were specific to a single I & R unit or school. In view of the importance attached to such variables by previous researchers, and their prominence in the generalized educational production function, it is desirable that they be represented in the data base when future research is designed.

Resource Inputs

Some data were available for three types of resource inputs — students, teachers, and expenditures for instruction. The data concerning teachers provided information on the background and characteristics of the I & R unit staff, e.g., their academic preparation, teaching experience, professional activities, and the like.

Staff Background Variables

Several variables relating to the background and characteristics of teachers were retained in the stepwise regression analyses. Whether or not teachers were currently enrolled in a degree program was one of the most useful variables in this category. Statistically significant partial correlations were found between teachers' enrollment in a degree program and average student scores in reading, mathematics, and social confidence. Years of teaching experience was also a useful variable, exhibiting a significant partial correlation with student scores in both mathematics achievement and social confidence. The partial correlation between the sex of teachers and student scores in mathematics was statistically significant with male teachers favored. Age of teachers was found to have a significant partial correlation with student reading achievement scores with older teachers favored.

Enrollment of teachers in a degree program. Student achievement scores in reading and in mathematics were related positively to the number of teachers in the I & R unit who were involved in a degree program. This finding supports Marinelli's (1976, p. 124) contention that "one of the keys to the teacher's effectiveness appears to be the recency of the teacher's latest educational experience." Whether involvement in a degree program acts directly to enhance student

achievement or whether it substitutes for other attributes which have a beneficial effect on student achievement are questions which were not answered by this research. Involvement in a degree program may reflect a professional attitude, a desire to keep up to date with the profession, aspiration toward upward mobility, or other attitudes related to better performance. On the other hand, it may simply make teachers more competent which translates directly into improved student performance. The data did not indicate the nature of the degree program, how seriously the teachers were pursuing a degree, or whether or not additional professional training through credit or noncredit courses not directed toward a graduate degree would produce similar results. However, the consistent statistically significant relationship between this variable and student achievement in reading and mathematics merits closer attention.

Years of teaching experience. Years of teaching experience was related positively to student achievement in mathematics in the staff background regression, and to both reading and mathematics achievement in the composite regressions. Other researchers have obtained similar findings, although it generally is argued that additional experience increases teacher productivity only during the early years of a teaching career (Marinelli, 1976, p. 127). The mean years of teaching experience for the teachers in this study was 8.12 years, indicating that a substantial portion were near the beginning of their careers. Additional research is needed to determine whether or not teaching effectiveness reaches a peak and then declines and, if this is found, whether steps can be taken to avert such a decline, e.g., by encouraging experienced teachers to enroll in a degree program.

Sex. In I & R units in which there were a larger proportion of male teachers, students exhibited higher achievement in mathematics. Whether or not male teachers do indeed teach mathematics more effectively than female teachers is a question not answered by this study. It has often been noted that girls are less inclined than boys to study mathematics when they reach the secondary school level. This situation might be related to the relative effectiveness of male and female teachers of mathematics at the elementary level, which may result in stereotyping on the basis of sex.

The staff background variables as a group were not particularly useful in explaining variance in student achievement scores. A set of 11 staff background variables explained only about 41 percent and 46 percent of the variance in reading and mathematics achievement, respectively.

Student Variables

The only data available concerning students were scores on the

Self-observation Scales, which provided a measure of student self-concept for the sample of students who completed the scales in each I & R unit.

Student self-concept. The seven self-concept variables which are measured by the Self-observation Scales accounted for 66 percent of the variance in reading achievement and 59 percent of the variance in mathematics achievement.

For reading achievement, the subscale social maturity[4] accounted for 64 percent of the variance compared with 66 percent accounted for by the set of seven self-concept variables. For mathematics achievement, the subscale social confidence[5] was the best predictor and accounted for 56 percent of the variance, whereas all seven variables accounted for 59 percent.

The high relationship between these two subscales and student achievement in reading and mathematics merits further research. The interrelationships of these variables with student academic achievement over time should be investigated through longitudinal studies with repeated measurements of individual students. Questions such as "Does academic performance affect student self-concept over time?" and "To what extent are student self-concepts altered by their academic performance?" could be asked by those seeking to understand the educational production process.

Expenditure Variables

The data collected were for total school (not I & R unit) expenditures per pupil enrolled and included the following: instructional salaries, supplies, books, maintenance, capital outlay, and other expenditures for instruction. Although the research team attempted to identify expenditures for subcategories such as salaries of teachers, aides, other specialists, and secretarial personnel of each I & R unit, such data were

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[4]Social maturity is described as follows (Katzenmeyer & Stenner, 1973): Children with high scores on this scale know how they are supposed to think and feel in a variety of social situations. They have learned the importance of such notions as "fair play," "sharing," "perseverence," "helpfulness," and "generosity." Children with low scores on this scale have not learned these notions and are likely to evidence behaviors that most adults would characterize as selfish, inconsiderate, or immature. Three items highly related to this scale are: I like to play only when I am the leader (− .51); I always have to be boss (− .46); I like to see other children happy (.31).

[5]Social confidence is described as follows (Katzenmeyer & Stenner, 1973): Children with high scores on this scale feel confident of their ability to relate successfully in social situations. They feel confident that they can make friends easily and that they are valued and enjoyed by their friends. Children with low scores have difficulty making friends, do not feel valued by others and see other people as being more socially adept than themselves. Three items highly related to this scale are: People are picking on me (− .71); Other children are often mean to me (− .59); My classmates like me (.56).

not available. We had to assume that the average expenditure per pupil for the school represented a reasonable approximation of the expenditure pattern of the I & R unit (which was the basis for analyzing teacher and pupil data). Data concerning the quantity and quality of instructional materials, the adequacy of space and equipment, and other aspects of the material resource inputs were not available.

Expenditures for instruction. The expenditure variables were not very useful in accounting for variance in reading, mathematics, or social confidence. Of the six variables for which reasonably complete data were available, only expenditure per pupil for instructional salaries was found to have a significant partial correlation with reading achievement and social confidence scores. None of the expenditure variables had statistically significant partial correlations with mathematics achievement scores. The six variables together accounted for only 17 percent of the variance in reading achievement, while expenditure per pupil for salary alone accounted for 11 percent. About 17 percent of the variance in mathematics achievement was accounted for by the six expenditure variables. With regard to social confidence, the set of instructional expenditure variables taken together accounted for about 29 percent of the variance with expenditure per pupil for instructional salaries alone accounting for over 16 percent of the variance.

Perhaps the failure to find statistically significant relationships can be attributed to the relatively gross expenditure data that were available. On the other hand, the amount of money spent may be far less important than what it is spent for. No measures of the quality, quantity, or appropriateness of instructional facilities and equipment were available in this study. The availability of supporting services could only be conjectured. Future research should attempt to gain more precise information concerning both the amounts of money spent and the items purchased.

Resource Input Mix

Two sets of variables which measured aspects of the resource input mix were obtained — time allocation of teachers and certain aspects of organizational and administrative arrangements. Teachers reported how much time they devoted to direct instruction and to noninstructional activities during a typical week. The direct instruction category was further subdivided by time spent on various subject areas (reading, mathematics, etc.) and by mode of instruction (large group, one-to-one, etc.). The noninstructional category was subdivided by type of activity (supervision, planning, record keeping, etc.). This procedure yielded a matrix of 52 variables.

No data on how pupils in the I & R units spent their time were available. These measures are needed and can only be gathered by ob-

serving individual pupils in classrooms. In addition, more accurate data are needed regarding the instructional decision making process in classrooms, the implementation of instructional decisions, and the use of instructional material by individual students and groups of students.

Time allocation. The time allocation variables were of limited use in explaining the variance in reading, mathematics, and social confidence scores. A set of 12 time allocation variables accounted for only 44 percent of the variance in reading achievement scores and the six variables retained in the final equation accounted for only about 37 percent of the variance. The six variables which exhibited statistically significant partial correlations with reading achievement included: time allocated to one-to-one, small group, and class size instruction in reading; total time allocated to instruction in reading and in language arts; and noninstructional time allocated to supervision.

A similar set of 12 time allocation variables accounted for only about 38 percent of the variance in mathematics achievement. None of the 12 variables were found to have a statistically significant partial correlation with mathematics achievement.

Six variables reflecting the allocation of instructional time by subject area and mode of instruction, and four variables reflecting the way teachers allocated their time to noninstructional activities were found to account for only about 38 percent of the variance in social confidence scores. Only noninstructional time spent supervising pupils exhibited a statistically significant partial correlation with social confidence scores, accounting for 12 percent of the variance.

The way in which teachers reported allocating their time bore no relationship to student achievement in mathematics. None of the time allocation variables exhibited statistically significant partial correlations with achievement in mathematics. Time allocation by teachers was more closely related to reading achievement, although the variance in reading achievement accounted for by the time allocation variables was relatively small. It is possible that data on how students (as opposed to teachers) spend their time would show a closer relationship to student achievement in reading and mathematics. Future research should attempt to obtain information concerning how students allocate their time. The data on teacher time allocations were taken from self-reports by the teachers. Perhaps independent observers would provide a more accurate record of how teachers spend their time.

Organization and administration. The set of nine variables classified as organizational variables included such items as ratings of the principal's leadership, teachers' decision involvement and job satisfaction, and teachers' rating of the extent to which the IGE model for in-

structional programming actually had been implemented. These variables measured various aspects of the instructional milieu or climate of the I & R unit in which data were gathered, rather than measuring directly the resource input mix.

The nine organizational variables accounted for about 45 percent of the variance in reading achievement. Three variables had statistically significant partial correlations with reading achievement (teachers' involvement in decision making, teachers' job satisfaction, and teachers' view of the principal's leadership) and accounted for 33 percent of the variance in this measure, with the principal's leadership exhibiting a negative partial correlation. The nine organizational variables accounted for less than 37 percent of the variance in mathematics achievement and only two of the variables exhibited statistically significant partial correlations. Implementation of the IPM in mathematics had a negative partial correlation while the partial correlation of teachers' involvement in decision making was positive. These two variables accounted for about 23 percent of the variance in mathematics achievement. The set of organizational variables accounted for only 20 percent of the variance in social confidence. None of the organizational variables were found to have a statistically significant partial correlation with social confidence.

One of the most intriguing findings of the study was the statistically significant negative partial correlation between the principal's leadership[6] as perceived by teachers and student achievement in reading. Although the corresponding partial correlations with mathematics achievement were not statistically significant, they were consistently negative. One can only speculate why the perceived leadership of principals was related negatively to student achievement. Perhaps, for example, teachers in schools where students do well academically have higher expectations for those with whom they work (both students and administrators) and therefore are more likely to be critical of the principal's leadership. In any event, the relationship of the principal's leadership to student achievement deserves further study.

The job satisfaction expressed by teachers and the involvement of teachers in decision making also were related to student achievement in reading and mathematics, respectively. As one would expect, these two variables were highly correlated. The relationship of school climate to student academic achievement merits further study.

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[6]The Principal Leadership Assessment, from which the data used in this study were obtained, was adopted from the leadership portion of the Survey of Organizations instrument developed at the University of Michigan. Bowers and Seashore (1966) developed the leadership measures and defined leadership as organizationally useful behavior by one member of an organizational family toward another member or members of the same organization. Principal leadership scores were derived by determining the mean score on each scale and summing the mean scores to obtain a total score on leadership for each respondent.

Outputs of Schooling

The measures of output used in this study were somewhat limited, particularly in terms of the range of outputs suggested by the conceptual framework. They involved only short range outputs — measures of student achievement in reading and mathematics as indicated by scores on standardized tests and a measure of student self-concept as indicated by the subscales of the Self-observation Scales. While most persons would agree that student achievement in reading and mathematics are important outputs of formal schooling, they certainly do not exhaust the possibilities. Additional measures of outcomes should be sought in future studies.

The data obtained from the Self-observation Scales were particularly interesting in that these variables were correlated closely with student achievement in reading and mathematics. Student self-concept is both an input to the educational production process and is itself affected by the process. It would appear that longitudinal studies with repeated measurements of individual students will be required to sort out the input- and output-related aspects of student self-concept.

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APPENDIX A

Selected characteristics of the 41 IGE schools and the 15 pairs of matched IGE and non-IGE schools are presented in Tables A-1 and A-2. The data for these tables were obtained from information published by the National Center for Educational Statistics (NCES). Data drawn from the 1970 census were tabulated for school districts in each state by the NCES. It should be emphasized that while these data may accurately characterize a given school district (in 1970) they may not accurately characterize a specific school attendance area within the district. In fact, the larger the school district, the less likely that these data will accurately reflect the characteristics of a given attendance area.

In Table A-1 are presented for each school its classification (other or urban) and enrollment, the population and median family income for the district, and the percent of population age 25 and over with at least 12 years of schooling in the district. Table A-2 presents the same set of characteristics for the matched pairs of IGE and non-IGE schools. As indicated in Table A-2, four of the matched pairs involved schools in adjacent districts (schools nos. 1 and 1, 19 and 4, 21 and 6, and 37 and 13). While schools 21 and 6 appear to be mismatched, school 21 was located in a suburban district adjacent to the city district in which school 6 was located and the characteristics of these two attendance areas were much more similar than the district figures indicate.

APPENDIX A

Table A-1

Selected Characteristics of IGE Schools Included in the Sample

School	School classification	School enrollment	School district population	Median family income in school district	Percent of population of district age 25 and over with at least 12 years of schooling
1	Other	387	2,685	9,971	47.9
2	City	800	3,392,636	10,336	60.0
3	Other	460	30,817	10,124	61.1
4	Other	280	10,502	7,197	61.0
5	Other	381	12,151	7,930	50.8
6	Other	180	80,396	8,928	71.2
7	Other	450	80,396	8,928	71.2
8	Other	293	14,028	8,038	47.1
9	Other	400	22,151	13,248	64.5
10	Other	500	52,851	10,650	52.4
11	Other	585	68,039	11,074	73.3
12	Other	302	3,820	9,926	55.0
13	City	1,050	3,365,020	10,244	43.9
14	Other	358	157,355	9,849	72.4
15	Other	900	102,551	7,954	26.8
16	Other	400	7,251	9,858	52.9
17	Other	580	30,102	10,882	52.4
18	City	534	280,392	10,108	50.0
19	Other	200	12,555	9,825	51.8
20	City	437	280,392	10,988	54.6
21	Other	389	4,280	29,075	90.0
22	Other	550	82,547	9,164	45.8
23	Other	270	26,972	10,480	62.2
24	Other	354	182,235	8,533	52.6
25	Other	200	15,694	8,186	66.4
26	City	540	807,057	9,748	52.2
27	Other	453	6,833	10,122	48.6
28	City	590	359,560	7,026	37.1
29	City	950	359,560	7,026	37.1
30	City	289	359,560	7,026	37.1
31	Other	750	197,459	10,428	70.9
32	Other	857	63,751	10,912	61.8
33	Other	580	24,404	9,526	52.9
34	Other	320	55,970	10,060	63.4
35	Other	430	105,869	10,226	59.8
36	Other	[illegible]	60,028	9,271	61.0
37	Other	500	8,434	10,106	62.1
38	Other	570	6,790	9,921	67.0
39	Other	450	37,677	8,545	56.9
40	Other	175	13,711	8,402	51.3
41	Other	435	52,199	11,854	63.5

Note. Source: National Center for Education Statistics, 1970.

Table A-2

Selected Characteristics of Matched IGE and Non-IGE Schools

School		School classification	School enrollment	School district population	Median family income in in school district	Percent of population of district age 25 and over with at least 12 years of schooling
I[a]	1	Other	387	2,665	9,971	47.9
N[b]	1	Other	505	8,538	9,030	44.0
I	7	Other	450	60,398	8,928	71.2
N	2	Other	470	60,398	8,928	71.2
I	14	Other	365	157,355	9,849	72.4
N	3	Other	400	157,355	9,849	72.4
I	19	Other	200	12,555	9,825	51.8
N	4	Other	250	15,911	9,626	51.4
I	20	City	437	280,392	10,988	54.6
N	5	City	478	280,392	10,988	54.6
I	21	Other	389	4,280	29,075	90.0
N	6	City	460	319,523	10,054	47.3
I	23	Other	270	26,972	10,480	62.2
N	7	Other	174	26,972	10,480	62.2
I	24	Other	354	182,235	8,533	52.6
N	8	Other	357	182,235	8,533	52.6
I	27	Other	453	6,833	10,122	48.6
N	9	Other	491	6,833	10,122	48.6
I	29	City	950	359,560	7,026	37.1
N	10	City	784	359,560	7,026	37.1
I	31	Other	750	197,459	10,428	70.9
N	11	Other	750	197,459	10,428	70.9
I	36	Other	419	60,028	9,271	61.0
N	12	Other	406	60,028	9,271	61.0
I	37	Other	500	8,434	10,106	62.1
N	13	Other	350	16,666	9,536	65.9
I	39	Other	450	37,677	8,645	56.9
N	14	Other	479	37,677	8,645	56.9
I	41	Other	435	52,199	11,854	63.5
N	15	Other	470	52,199	11,854	63.5

Note. Source: National Center for Education Statistics, 1970.

[a]IGE Schools.
[b]Non-IGE Schools.

APPENDIX B

Description and Classification of 134 Variables

	Staff background information	Number of cases	Mean	SD	Variance	Minimum value	Maximum value	Variable classification
1.	*BIQ1 Highest level of professional preparation: 1 = BA...6 = Ph.D.*	28	1.80	.691	.477	1.00	3.80	Human resource
2.	*BIQ2 Presently enrolled in a degree program: 1 = Yes, 2 = No*	28	1.70	.250	.062	1.25	2.00	Human resource
3.	*BIQ3 Articles or presentation in the last 5 years: 1 = Yes, 2 = No*	28	1.85	.255	.051	1.25	2.00	Human resource
4.	*BIQ4 Approximate number of articles/presentations*	15	.70	1.010	1.020	.00	3.00	Human resource
5.	*BIQ5 Sex: 1 = Female, 2 = Male*	28	1.33	.216	.046	1.00	1.80	Human resource
6.	*BIQ6 Participation in IGE Staff development workshop in past 2 years: 1 = Yes, 2 = No*	28	1.30	.283	.080	1.00	2.00	Human resource
7.	*BIQ7 Years of teaching experience*	28	8.12	4.920	24.207	1.75	21.00	Human resource
8.	*BIQ8 Years teaching in present district*	28	5.68	3.046	9.278	1.00	13.00	Human resource
9.	*BIQ9 Years teaching in present school*	28	3.86	2.102	4.420	1.00	10.50	Human resource
10.	*BIQ10 Years teaching in IGE schools*	28	2.76	.941	.885	1.00	4.67	Human resource
11.	*BIQ11 Number of district committees of which one is a member*	28	1.16	.647	.418	.00	2.33	Human resource
12.	*BIQ12 Number of professional organizations to which one is a member*	28	2.44	1.046	1.094	.50	5.00	Human resource
13.	*BIQ13 Number of professional organizational meetings attended per year*	27	5.92	3.089	9.542	1.00	15.00	Human resource
14.	*BIQ14 Number of offices held in professional organizations in the last 5 years*	28	.95	.579	.335	.00	1.67	Human resource
15.	*BIQ15 Age*	27	32.89	7.972	63.599	.00	49.00	Human resource

continued

	Staff background information	Number of cases	Mean	SD	Variance	Minimum value	Maximum value	Variable classification
16.	*BIQ16* *Number of meetings of I & R Unit per week*	28	2.04	1.448	2.097	.67	6.00	Human resource
17.	*BIQ17* *Minutes spent in planning, etc. each week by unit*	28	154.94	92.107	8483.600	20.00	360.00	Human resource
18.	*BIQ18* *Total years in present unit*	28	2.32	.911	.824	.50	4.00	Human resource
19.	*BIQ19*	0	.00	.00	.00	.00	.00	Not used
20.	*BIQ20* *Overall feeling about your school: 1 = Feels really good about it... 7 = Feels really bad about it*	28	5.77	.840	.705	2.67	7.00	Human resource
	Instructional time information							
21.	*INSTR* *Total time spent on instruction in hours per week*	28	24.348	4.55	20.704	14.25	36.00	Resource input mix
22.	*R1TO1* *Time spent on reading 1 : 1 in hours per week*	28	1.87	1.32	1.741	.25	5.50	Resource input mix
23.	*RSMALL* *Reading small group: Hours/week*	28	2.40	1.51	2.283	.33	7.5	Resource input mix
24.	*RCLASS* *Reading class size: Hours/week*	28	1.82	1.64	2.69	.00	6.25	Resource input mix
25.	*RLARGE* *Reading large group: Hours/week*	28	.02	.07	.006	.00	.33	Resource input mix
26.	*ROTHER* *Reading other sized groups: Hours/week*	28	.01	.06	.003	.00	.31	Resource input mix
27.	*L1TO1* *Time spent on language arts 1 : 1 Hours/week*	28	1.16	1.37	1.88	.00	6.00	Resource input mix
28.	*LSMALL* *Language small group: Hours/week*	28	.80	.85	.723	.00	4.00	Resource input mix
29.	*LCLASS* *Language class size Hours/week*	28	2.48	1.27	1.62	.25	5.33	Resource input mix
30.	*LLARGE* *Language large group: Hours/week*	28	.03	.06	.006	.00	.33	Resource input mix
31.	*LOTHER* *Language other sized group: Hours/week*	28	.00	.00	.00	.00	.00	Resource input mix
32.	*M1TO1* *Math 1 : 1: Hours/week*	28	2.15	1.34	1.79	.00	5.13	Resource input mix

continued

	Instructional time information	Number of cases	Mean	SD	Variance	Minimum value	Maximum value	Variable classification
33.	*MSMALL* *Math small group: Hours/week*	28	1.33	1.11	1.23	.00	4.17	Resource input mix
34.	*MCLASS* *Math class size: Hours/week*	28	1.67	1.36	1.86	.00	.13	Resource input mix
35.	*MLARGE* *Math large group: Hours/week*	28	.006	.02	.0008	.00	.13	Resource input mix
36.	*MOTHER* *Math other sized*	28	.00	.00	.00	.00	.00	Resource input mix
37.	*SC1TO1* *Science 1 : 1: Hours/week*	28	.76	1.25	1.56	.00	5.00	Resource input mix
38.	*SCSMALL* *Science small group: Hours/week*	28	.53	.74	.55	.00	2.50	Resource input mix
39.	*SCCLASS* *Science class size: Hours/week*	28	1.70	1.44	2.069	.00	5.00	Resource input mix
40.	*SCLARGE* *Science large group: Hours/week*	28	.03	.11	.011	.00	.50	Resource input mix
41.	*SCOTHER* *Science other sized group: Hours/week*	28	.00	.00	.00	.00	.00	Resource input mix
42.	*SO1TO1* *Social studies 1 : 1: Hours/week*	28	.80	1.18	1.385	.00	4.67	Resource input mix
43.	*SOSMALL* *Social studies small group: Hours/week*	28	.47	.71	.498	.00	3.00	Resource input mix
44.	*SOCLASS* *Social studies class size group: hours/week*	28	1.87	1.35	1.819	.00	5.50	Resource input mix
45.	*SOLARGE* *Social studies large group: Hours/week*	28	.05	.14	.020	.00	.50	Resource input mix
46.	*SOOTHER* *Social studies other sized group: Hours/week*	28	.00	.00	.00	.00	.00	Resource input mix
47.	*O1TO1* *Other subjects: Hours/week*	28	.52	.81	.664	.00	2.75	Resource input mix
48.	*OSMALL* *Other subjects small group: Hours/week*	28	.37	.66	.418	.00	2.67	Resource input mix
49.	*OCLASS* *Other subjects class sized group: Hours/ week*	28	1.64	2.06	4.19	.00	7.13	Resource input mix
50.	*OLARGE* *Other subjects large group: Hours/week*	28	.06	.24	.057	.00	1.25	Resource input mix
51.	*OOTHER* *Other subject other sized groups: Hours/week*	28	.00	.00	.00	.00	.00	Resource input mix

continued

	Instructional time information	Number of cases	Mean	SD	Variance	Minimum value	Maximum value	Variable classification
52.	*NON* *Total time on non-instructional activities: Hours/week*	28	18.35	5.66	32.017	7.25	31.08	Resource input mix
53.	*IIIA* *Supervision of pupils: Hours/week*	28	1.32	1.16	1.347	.00	4.83	Resource input mix
54.	*IIIB* *Planning time: Hours/week*	28	6.57	3.77	14.182	2.25	19.00	Resource input mix
55.	*IIIC* *Testing/Assessing/ Evaluating: Hours/week*	28	3.11	2.97	8.80	.50	17.33	Resource input mix
56.	*IIID* *Record keeping: Hours/week*	28	1.41	1.19	1.426	.50	6.13	Resource input mix
57.	*IIIE* *Inservice training: Hours/week*	28	.81	.99	.999	.00	5.00	Resource input mix
58.	*IIIF* *Clerical/Secretarial: Hours/week*	28	3.23	2.18	4.769	.00	8.17	Resource input mix
59.	*IIIG* *Administrative: Hours/week*	28	.32	.49	.24	.00	2.00	Resource input mix
60.	*IIIH* *Other non-instructional time: Hours/week*	28	.62	.68	.466	.00	2.33	Resource input mix
61.	*TREAD* *Total time in reading per school: Hours/week*	28	8.12	2.04	4.17	2.25	10.00	Resource input mix
62.	*TLANG* *Total time in language per school: Hours/week*	28	4.26	1.41	1.99	1.13	7.50	Resource input mix
63.	*TMATH* *Total time in math per school: Hours/week*	28	5.16	1.26	1.578	1.00	8.00	Resource input mix
64.	*TSCI* *Total time in science per school: hours/week*	28	3.02	1.69	2.84	.00	8.00	Resource input mix
65.	*TSOC* *Total time in social studies per school: hours/week*	28	3.19	1.86	3.46	.00	9.00	Resource input mix
66.	*TOTHCUR* *Total time on other curricular subjects per school: hours/week*	28	2.80	2.43	5.89	.00	7.67	Resource input mix
67.	*T1TO1* *Total time in 1 : 1 for all instructional areas: hours/week*	28	7.26	5.11	26.158	1.00	21.00	Resource input mix
68.	*TSMALL* *Total time in small group instruction for all areas: hours/week*	28	5.69	3.12	9.761	1.50	13.33	Resource input mix

continued

	Instructional time information	Number of cases	Mean	SD	Variance	Minimum value	Maximum value	Variable classification
69.	*TCLASS* *Total time in class sized instruction for all areas: hours/week*	28	11.19	5.76	33.156	2.92	21.75	Resource input mix
70.	*TLARGE* *Total time spent in large group instruction (more than one class) for all areas: hours/week*	28	.20	.33	.112	.00	1.25	Resource input mix
71.	*TOTHSZ* *Total time spent on instruction for other sized groups for all areas: hours/week*	28	.01	.06	.003	.00	.31	Resource input mix
72.	*TBLTOT* *Total time allocated to instruction per school (the sum of variables 61 through 71)*	28	24.36	4.54	20.616	14.25	36.00	Resource input mix
	Expenditure information							
73.	*PRSAL* *That part of the principal's salary for instruction/pupil*	28	45.15	20.49	419.76	13.68	111.11	Material resource
74.	*TCHSAL* *Teacher salary for instruction/pupil*	28	474.71	140.87	19843.00	197.07	797.90	Material resource
75.	*PROSAL* *Other certified staff's salary for instruction per pupil*	21	295.98	417.27	174120.00	.00	999.99	Material resource
76.	*SECSAL* *Secretary's salary for instruction/pupil*	28	21.13	14.31	204.57	1.74	57.30	Material resource
77.	*OTHSAL* *Other staff salaries for instruction/pupil*	23	208.57	376.66	141870.00	.00	999.99	Material resource
78.	*INSTRSUP* *Cost of instructional supplies/pupil*	27	48.45	186.88	34925.00	1.30	999.99	Material resource
79.	*OTHSUP* *Cost of other supplies per pupil*	22	217.18	416.32	173320.00	.09	999.99	Material resource
80.	*TEXTBOOK* *Expenditures for textbooks/pupil*	24	148.51	354.02	125330.00	.04	999.99	Material resource
81.	*LIBRBOOK* *Expenditures for library books/pupil*	28	3.83	3.66	13.379	.00	20.00	Material resource
82.	*PERIOD* *Expenditures for periodicals/pupil*	23	179.04	389.80	151940.00	.05	999.99	Material resource
83	*AUDIO* *Expenditures for audio/visual materials/pupil*	24	148.12	365.41	126320.00	.21	999.99	Material resource

continued

	Expenditure information	Number of cases	Mean	SD	Variance	Minimum value	Maximum value	Variable classification
84.	*OTHBOOK* *Expenditures for other books per pupil*	14	500.51	508.64	258720.00	.00	999.99	Material resource
85.	*TRAVEL* *Expenditures related to travel per pupil*	25	108.31	314.58	98946.00	.00	999.99	Material resource
86.	*INSERV* *Expenditures for inservice activities per pupil*	15	464.97	507.21	257270.00	.00	999.99	Material resource
87.	*OTHSERV* *Expenditures for other services/pupil (e.g., field trips, speakers)*	12	571.82	503.48	253480.00	.00	999.99	Material resource
88.	*PLANTENG* *Maintenance supervisor salaries per pupil*	11	612.10	491.10	241180.00	.00	999.99	Material resource
89.	*CUST* *Custodian salaries per pupil*	27	74.96	182.59	33340.00	1.52	999.99	Material resource
90.	*PLANTSUP* *Consumable custodial supplies per pupil*	22	218.52	415.64	172750.00	.38	999.99	Material resource
91.	*PLANTUTL* *Plant utility expenditure per pupil*	25	132.04	306.67	94049.00	1.89	999.99	Material resource
92.	*OTHPLANT* *Other plant expenditures*	11	608.54	495.58	245600.00	.00	999.99	Material resource
93.	*REPAIRS* *Repairs for plant*	21	257.04	436.91	190890.00	1.16	999.99	Material resource
94.	*REPLEQIP* *Expenditures for replacing equipment*	19	323.40	474.21	224880.00	.47	999.99	Material resource
95.	*ADDEQIP* *Additional expenditures for equipment*	24	145.73	355.16	126140.00	.00	999.99	Material resource
96.	*AVETCH* *Average teacher salary*	28	10959.00	2020.90	4083900.00	7000.00	15083.00	Material resource
97.	*AVEPRI* *Average principal's salary*	27	17142.00	3270.10	10693000.00	10000.00	24000.00	Material resource
98.	*AVEAIDE* *Average aide's salary*	28	3514.70	1038.80	1075000.00	999.99	6075.00	Material resource
99.	*AVESEC* *Average secretary's salary*	28	5497.80	1108.30	1224000.00	4000.00	7500.00	Material resource
100.	*FRNGTCH* *Teacher fringe benefits*	25	109.77	314.05	98626.00	.00	999.99	Material resource
101.	*FRNGPRI* *Principal's fringe benefits per pupil*	26	75.178	261.23	68242.00	.00	999.99	Material resource
102.	*FRNGAID* *Aide's fringe benefits per pupil*	23	179.43	389.61	151800.00	.00	999.99	Material resource

continued

	Instructional time information	Number of cases	Mean	SD	Variance	Minimum value	Maximum value	Variable classification
103.	*FRNGSEC* *Secretary's fringe benefits per pupil*	26	72.949	261.84	68559.00	.00	999.99	Material resource
104.	*ULCOMP* *Unit leader compensation per pupil*	28	.55571	.78101	.60997	.00	2.29	Material resource
105.	*SCHSIZ* *School size (total no. of pupils)*	28	482.25	197.91	39188.00	175.00	950.00	Material resource
106.	*SALARY* *Total salary for instruction per pupil*	28	616.95	181.25	32853.00	232.74	940.13	Material resource
107.	*SUPPLY* *Total expenditures for supplies per pupil*	28	15.637	14.66	215.08	1.39	81.00	Material resource
108.	*BOOKS* *Total expenditures for books per pupil*	28	12.730	10.35	107.15	1.21	53.50	Material resource
109.	*OTHEREXP* *Total other expenditures per pupil*	26	76.694	261.84	68454.00	.00	999.99	Material resource
110.	*PLANT* *Total expenditures for physical plant per pupil*	27	110.48	177.95	31668.00	1.90	999.99	Material resource
111.	*CAPITAL* *Total expenditures for capital outlay per pupil*	25	112.00	313.30	98159.00	.47	999.99	Material resource
112.	*ACCEPT* *Self-acceptance*	28	5071.3	291.6100	85037	4433.000	5551.000	Human resource input/output
113.	*SECURITY* *Security*	28	4958.6	227.4700	51741	4830.000	5664.000	Human resource input/output
114.	*MATURITY* *Social maturity*	28	4945.7	434.980	189200	3711.000	5528.000	Human resource input/output
115.	*CONFIDNT* *Social confidence*	28	5410.4	307.810	94745	4800.000	5945.000	Human resource input/output
116.	*SCHAFFIL* *School affiliation*	28	5213.7	341.530	116640	4697.000	5872.000	Human resource input/output
117.	*TCHAFFIL* *Teacher affiliation*	28	5031.2	320.860	102950	4200.000	5488.000	Human resource input/output
118.	*PEERAFFL* *Peer affiliation*	28	4994.8	294.340	86635	4347.000	5478.000	Human resource input/output
119.	*VOCAB* *Reading vocabulary*	28	50.299	5.7311	32.846	38.435	60.527	Human resource output
120.	*COMPREH* *Reading Comprehension*	28	50.437	5.2797	27.876	38.556	58.822	Human resource output
121.	*READ* *Total reading*	28	50.453	5.8009	33.650	37.569	60.205	Human resource output

continued

	Math achievement variable	Number of cases	Mean	SD	Variance	Minimum value	Maximum value	Variable classification
122.	*MATHCOMP* *Math computation*	28	49.553	4.8228	23.259	39.226	57.253	Human res. output
123.	*MATHCONC* *Math concepts*	28	49.536	4.6689	22.060	40.099	58.398	Human res. output
124.	*MATHAPPL* *Math applications*	28	49.912	4.7956	22.998	41.098	56.850	Human res. output
125.	*MATH* *Math total*	28	49.624	5.0339	25.340	38.736	57.456	Human res. output
	Organizational variables information							
126.	*PRLDRSHP* *Teachers' perception of principal's leader behavior: 1 = very little...5 = very great*	28	3.8186	.56235	.316	2.43	4.60	Resource input mix
127.	*TOTJSAT* *Teachers' total job satisfaction: 1 = very little...5 = very great*	28	3.42	.43	.189	2.50	4.13	Resource input mix
128.	*DIASC3Q3* *Teachers' decision involvement (Unit) 1 = very little... 5 = very great*	28	3.70	.63	.392	2.67	4.79	Resource input mix
129.	*DIATOTQ3* *Teachers' decision involvement (Total) 1 = very little... 5 = very great*	28	2.58	.40	.158	1.85	3.47	Resource input mix
130.	*DIASC3Q4* *Teachers' satisfaction with decision involvement (Unit): 1 = very little...5 = very great*	28	3.53	.64	.412	2.17	4.83	Resource input mix
131.	*DIATOTQ4* *Teachers' satisfaction with decision involvement (Total): 1 = very little...5 = very great*	28	2.73	.49	.239	1.71	3.67	Resource input mix
132.	*IPMREAD* *Teachers' perception of IPM implementation in reading: 1 = very little...5 = very great*	28	3.70	.52	.273	2.75	4.76	Resource input mix
133.	*IPMMATH* *Teachers' perception of IPM implementation in math: 1 = very little...5 = very great*	28	3.73	.53	.276	2.85	4.80	Resource input mix
134.	*IRTOTAL* *Teachers' perception of I & R Unit operation (Total): 1 = very little...5 = very great*	28	3.63	.48	.228	2.81	4.70	Resource input mix